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Pedagogy
Challenges, Recent Advances, New Perspectives, and Applications

Edited by Hülya Şenol

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Contributors

Dulce Regina Baggio Osinski, Ricardo Carneiro Antonio, Abdessatar Rejeb, Kåre Hauge, Ajitha Nayar, Janet Hobley, Bharti Pandya, BooYun Cho, Louise Patterson, Kathryn Meyer Grushka, Ben Knight, Anneli Frelin, Jan Grannäs, Cestmir Serafin, Robsan Margo Egne, José Jesús Vargas Delgado, Viviana Nocetti Gómez, María Paz González, Pablo Gutiérrez, Sunday Paul C. Onwuegbuchulam, Mamsi Ethel Khuzwayo, Sayeed Naqibullah Orfan, Ebtisam Niazi, Calvin Odhiambo, Jennifer Moore Bernstein, Cameron Audras, Jennifer Swift, Charmaine Dalisay, Daniel Dei, Magdalena Pando, Tahmina Hoq, Mahbub Ahsan Khan, Cirit Mateus, Daladier Jabba, Rodrigo Campis, Karim Medico Letwinsky, Michael Berry, Adri Du Toit, Sabina N. Valente, Abílio A. Afonso Lourenço, Sergio Dominguez-Lara, David G. Grant, Listyani Listyani, Nomxolisi Mtsi, Shakespear M. Chiphambo, Nomaroma Kumanda, Ned Vito Quevedo Arnaiz, Nemis García Arias, Fredy Pablo Cañizares Galarza, Richard Shukia, Stansilaus James Marobo, Eleni Mousena, Trifeni Sidiropoulou, Maretta Sidiropoulou, Hülya Şenol, Serdal Işiktaş

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IntechOpen Book Series

Education and Human Development

Volume 1

Aims and Scope of the Series

Education and Human Development is an interdisciplinary research area that aims to shed light on topics related to both learning and development. This Series is intended for researchers, practitioners, and students who are interested in understanding more about these fields and their applications.

Meet the Series Editor

Katherine Stavropoulos received her BA in Psychology from Trinity College, in Connecticut, USA and her Ph.D. in Experimental Psychology from the University of California, San Diego. She completed her postdoctoral work at the Yale Child Study Center with Dr. James McPartland. Dr. Stavropoulos' doctoral dissertation explored neural correlates of reward anticipation to social versus nonsocial stimuli in children with and without autism spectrum disorders (ASD). She has been a faculty member at the University of California, Riverside in the School of Education since 2016. Her research focuses on translational studies to explore the reward system in ASD, as well as how anxiety contributes to social challenges in ASD. She also investigates how behavioral interventions affect neural activity, behavior, and school performance in children with ASD. She is also involved in the diagnosis of children with ASD and is a licensed clinical psychologist in California. She is the Assistant Director of the SEARCH Center at UCR and is a faculty member in the Graduate Program in Neuroscience.

Meet the Volume Editor

Assist. Prof. Dr. Hülya Şenol is a multidisciplinary researcher and academician with 31 years of teaching experience. She graduated from the Biology Department, Atatürk Education Faculty, Marmara University, Turkey, in 1991. She completed two master's degrees, one in Educational Sciences at Eastern Mediterranean University, North Cyprus, and one in Molecular Medicine at Near East University, North Cyprus. She holds a Ph.D. in Educational Administration, Management, Inspection, and Economy. From 1991 to 2011, she worked at many colleges in Turkey and North Cyprus as an instructor, ISO 9001 committee member, and deputy principal. She worked as a senior instructor in the Faculty of Arts and Sciences and Faculty of Education at Eastern Mediterranean University from 2004 to 2022. She has been a faculty member of the Faculty of Education, dean of the Engineering Faculty, and head of Biomedical Sciences at Cyprus Health and Social Sciences University, North Cyprus. She has published many book chapters and articles in international peer-reviewed journals. Her research interest areas are educational leadership, professional development of leaders in education, school culture, total quality management in education, and service quality in education.

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Preface

The 21st century has been characterized by many rapid changes, transformations, and challenges due to developments in technology and the economy. These changes have caused disruptions in careers, jobs, and the demands of firms seeking highly qualified employees. In addition, the Covid-19 pandemic has caused economic, social, health, and educational disruptions; the latter resulting in the mandated widespread use of online teaching and learning, which has created educational challenges, especially for developing and underdeveloped countries, and increased inequality in education. All these events have placed enormous demands on educational systems to prepare students for the workforce and have increased the importance of knowledge and education. Quality education is a human right that has the power to build peace, gender equality, sustainable development, health, and wellbeing. As such, schools should be concerned with the delivery of quality education to support and advance the 21st-century skills of their students. These skills include learning, innovation, digital literacy, and career skills. Schools must consider not only the needs and opinions of all students and teachers from preschool to higher education but also the results of research and suggestions for providing quality education.

In this book, expert scholars from different countries share their opinions, evaluations, and research about the challenges, advances, perspectives, and applications of education at all levels. It is a valuable resource for educators as well as countries and schools seeking to strengthen their educational systems. It includes valuable information that will contribute to schools developing quality education programs in the future and teachers developing student-centered, effective contemporary teaching methods.

Dr. Hülya Şenol
Assistant Professor,
Cyprus Health and Social Sciences University,
Güzelyurt, North Cyprus

Professional Development of Educators

Chapter 1

Curriculum for Citizenship and Sustainability

Eleni Mousena, Trifeni Sidiropoulou and Maretta Sidiropoulou

Abstract

Citizenship, as the making of citizens, is an empirical and intellectual educational process. The ability of citizens to understand the world and also their responsible and active attitude has to address the issue of sustainability in the 21st century, i.e., an environment that will continue to exist for the future generations of citizens. Sustainability has emerged as a contemporary political value, as both the destruction of the natural environment and the complex social problems of humanity are threatening the development and self-realisation of humans and posing limitations, an issue of concern to the academic community and political leaders. Active and responsible political attitudes are cultivated through educational experiences and curricula that are engaging and meaningful to students. This chapter analyses the concepts of citizenship and sustainability, refers to the Sustainable Development Goals (SDGs) as defined in a UN conference (Agenda 2030) and presents ways to promote sustainability in education as well as relevant research, with a focus on the natural environment. It is concluded that a 4Cs curriculum on citizenship and sustainability is grounded on civic and political values, developed in the conceptual framework of critical pedagogy, methodologically operates the school as a civil society forum and needs competent teachers to implement it.

Keywords: citizenship, sustainability, 4Cs curriculum, political values, civil society

1. Introduction

Making citizens is a major objective of contemporary education systems. Citizenship at first glance seems to be a complex concept and an extremely demanding educational process. The questions one might initially ask are: what does citizenship mean; how is it built; how is it taught; through what means and materials; what are its aims; what qualifications should those who teach it have; what age groups of pupils are concerned; how are curricula for citizenship designed; is the content oriented locally, regionally or globally; what is its relationship to sustainability and sustainable development?

In terms of curricula, this objective appears in two forms: either as a cross-curricular goal or process or as a distinct school subject with its own syllabus. Recent views of citizenship education academics, however, are not in favour of either of these approaches. They argue that for the desired outcomes to be achieved, citizenship

education should be both a cross-curricular goal and a distinct cognitive domain, with its own materials and with specific time and space allocated to it in the educational process. The content of citizenship education today focuses on the development of an autonomous personality that is characterised by a democratic political identity and an understanding of and respect for diversity and 'otherness' [1, 2]. Sustainability is arising as a contemporary political value and curricula are oriented to conclude related content and activities.

The fact that nation building was a necessary precondition for the development of modern education systems can explain, to a certain extent, the ethnocentric orientation of education and the strengthening of national identity it has brought about. Nonetheless, this trait imposes constraints on the formation of a democratic political identity with a global view, and it restricts understanding of social pluralism and multiculturalism [2].

The ability to live together in a democracy does not come naturally, it is an experiential and a spiritual process. The knowledge, skills and values that are the preconditions of living in a democracy should be learnt from early years to the adulthood. The components of citizenship education are school climate, curriculum and teaching strategies, pedagogy in the community and making the school a civil society forum. As Paulo Freire proposes, the schools should facilitate the practice of freedom, the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of the world [3].

The traditional curricula, promoting the 3Rs (Reading, Writing, Arithmetic), do not seem to suffice to respond to current challenges. These curricula cultivate mainly literacy tools. Knowledge about the natural and social phenomena are the subject of the natural and social sciences. In particular, knowledge, skills and values about the socio-political organisation of the world are the domain of the social sciences.

This chapter analyses the concepts of citizenship and sustainability, refers to the Sustainable Development Goals (SDGs) as defined in a UN conference (Agenda 2030, Seventeen Sustainable Development Goals—SDGs) and presents ways to promote sustainability in education as well as relevant research, with a focus on goals related to the natural environment. We explore the ideological framework; the content and the appropriate methods for a curriculum of citizenship education.

2. Citizenship and citizenship education

> *'Education is always a political act... It is impossible to remain neutral in education, all educational policies and practices have social implications'*
>
> *Paulo Freire*

Citizenship is a highly complex concept. Citizenship means being a member of a political community. The members of this political community have the same rights and responsibilities towards the state and other members of the community. Thus, citizenship is a legal status on the one hand, and a social relationship between citizens on the other [4].

The term citizenship implies a relationship, the relationship of the individual with the public life and with the polity. It is the status of a person that makes him/her a citizen, and this is achieved on the one hand empirically as a process of socialisation and education, and on the other hand legally as a status conferred by law. In the

former case, we have a *de facto* acquisition of citizenship, while in the latter we have a *de jure* conferment of political rights on individuals. The de jure procedure for acquiring citizenship varies from country to country, with differences concerning persons who have a first citizenship of another country or are stateless. Such cases are mainly migrant populations or refugees.

In her paper *The Public Self,* Virginia Rettinger describes the way in which the public self is expressed. According to her, the public self is that part of the self which is concerned with political and social issues. To a certain extent, all individuals express this part of themselves. The two forms of being, public and private, are manifested in situations and activities, which are clearly distinct from one another. For the formation of the public self to be achieved, understanding, nurturing and support are necessary. In identifying its main characteristics, Rettinger suggests that the public self:

- seeks to express itself in the public sphere, a space where many persons assemble and which is open to all;

- enters the public space with the aim of connecting with others through discourse and action. Indeed, political activity is defined as a number of people who speak and act together publicly;

- focuses on public issues or problems, with the ultimate goal of producing a public good [5].

In its strict sense, citizenship is a legal concept, and it can only be exercised in the context of a state. Citizenship implies a sense of identity, loyalty, and devotion to the idea that the citizen should assume responsibilities for the state, which is the source of the political rights he/she enjoys. Heater claims that instruction in citizenship, as a status and a right, can only be partial and distorted unless it addresses the issue of identity and loyalty ([6], pp. 62–63). It is perceived as an idea or an ideal comprising of five constituent traits. It can be seen that the most clear-cut aspects are those regarding the legal, political and social status of citizenship. *Civil citizenship* is about the protection of civil rights, *political citizenship* is about the relationship between the law and election procedures and *social citizenship* refers to all things related to social welfare and social benefits. The other two aspects of citizenship, *civic virtue* and *identity*, are less tangible. They both refer to the experiential relationship between the citizen and the polity. Civic virtue, being a good citizen, means to behave in a politically moral way towards the state-polity and to your fellow citizens. The quality of civic virtue is based on political identity [6]. Essentially, political identity is free from the restrictions of the nation-state and the exclusive commitment to a unique level of political loyalty.

The concept of *global citizenship* does not relate to nation-states or similar geographical and political entities. Global Citizenship Identity focuses on the development of active and democratic citizens who are characterised by global consciousness, a shared understanding of current humanity issues and a strong interest in providing solutions. UNESCO identifies Global Citizenship as 'a sense of belonging to a broader community and common humanity. It emphasizes political, economic, social and cultural interdependency and interconnectedness between the local, the national and the global' ([7], p. 14).

2.1 Citizenship education

Citizenship education is a part of the education systems of all modern states. Pedagogues, philosophers, political scientists and sociologists have sought to define the field of citizenship education. There are a number of definitions, each reflecting the respective viewpoint (ideological, theoretical and didactic) and the specific historical circumstances in which each of these attempts was made. This is a strong indication of the inherent dynamics of citizenship education, which has been linked to the construction and operation of the nation state, while today, in the globalisation era, a cosmopolitan approach is being promoted.

Various terms have been used for citizenship education such as *Civic Education*, *Political Education*, *Education for Citizenship*, *Education for Democracy*, *Law-related Education and Values Education*, which can be found in the literature. All of these terms suggest the study of political issues such as political values, democracy, law, rights and responsibilities, peace education, intercultural education and education for sustainable development.

The necessity of citizenship education is set out in the Convention on the Rights of the Child, where Article 29 declares that 'The States Parties agree that the education of the child shall be directed to … (d) the preparation of the child for responsible life in a free society, in the spirit of understanding, peace, tolerance, equality of sexes, and friendship among all peoples, ethnic, national and religious groups and persons of indigenous origin; (e) The development of respect for the natural environment' ([8], p. 9).

The construction of the political identity has its roots in ancient Greek literature, and of certainly distinguished philosophers and pedagogues, such as Rousseau, Dewey, Freire, Giroux, Crick and Reimers, have strongly emphasised the importance of this central aim of education. Dewey stresses that 'Since a democratic society repudiates the principle of external authority, it must find a substitute in voluntary disposition and interest; these can be created only by education. … A democracy is more than a form of government; it is primarily a mode of associated living, of conjoint communicated experience' ([9], p. 87). For Paulo Freire, education is always a political act, and also it is impossible to remain neutral in education, all educational policies and practices have social implications [3]. Therefore, the basic purpose of education is the formation of the autonomous and active citizen. The concept of the active citizen has been interpreted as that of a citizen who 'governs himself and takes responsibility for his actions, thus reducing his dependence on the state' ([10], p. 774) 'to be a citizen is to participate' ([11], p. 85), also, 'It is only when one leaves one's home and enters the public space that the dialogue about a citizen's idiosyncrasy begins' ([12], p. 41). Also, 'Citizenship or civics education is construed to encompass the preparation of young people for their roles and responsibilities as citizens and, in particular, the role of education (through schooling, teaching and learning) in that preparatory process.' ([13], p. 2) and 'Citizenship education cannot stand by itself, independent of cultural norms, political priorities, social expectations, national economic development aspirations, geo-political contexts and historical antecedents' ([14], p. 17).

According to the Council of Europe, 'Education for democratic citizenship means education, training, awareness-raising, information, practices and activities which aim, by equipping learners with knowledge, skills and understanding and developing their attitudes and behaviour, to empower them to exercise and defend their democratic rights and responsibilities in society, to value diversity and to play

an active part in democratic life, with a view to the promotion and protection of democracy and the rule of law' ([15], s.I.1.b).

Crick and Lister have provided a definition of citizenship education encompassing all its main aspects. According to them, the description of the main characteristics of political literacy is crucial and it should precede the formulation of any proposal concerning curriculum frameworks for the subject of Citizenship Education. In their document *Political Literacy, the centrality of the concept*, they attempt a theoretical conflation of political theories with education theory. Three important aspects of citizenship education are noted:

1. A broad definition of politics, which is not limited to political institutions, state jurisdictions or the activities of political parties and pressure groups but which also incorporates the 'politics of everyday life', exercised, among others, by the family, the local community, educational institutions, the workplace and unionism.

2. The belief that citizenship education should be founded on controversial issues, as 'politics is inevitably involved in conflicts of interest and ideas'. Through awareness of controversial issues and the process of conflict resolution, students should be provided with an insight into the political process.

3. Knowledge, skills and behaviours contribute to the acquisition of political literacy. These should be developed in parallel with one another and 'each of them should determine the rest', as political literacy 'includes both an understanding of what one is within a context and one's capacity to act'. Action should be emphasised as a dimension since 'the final structure of political literacy lies in the creation of a tendency for action, not in the achievement of even more theoretical analysis' ([16], p. 3).

The above definition is principally oriented to the microsystem of each school's educational community, taking into consideration all the factors that may be involved in the developmental process of this school subject. However, schools do not evolve in a vacuum. Rather, they exist and operate within the context of a specific community, a particular political system. Today, a broader approach should be taken to school knowledge for the reason that social identities and cultures are no longer secure and static, 'Social mobility, migration, increased awareness of gender, environmental concerns, social exclusion and class all continue to contribute to a general challenge to traditional verities' ([17], p. 97).

Serious objections have been voiced with regard to ethnocentric curricula. The most notable of these focuses on the discrepancy between the fact that pedagogical work cultivates a humanitarian culture while, at the same time, it promotes views on separate races, and friendly and barbarian peoples [2]. The "political cosmopolitasnism" advocates the world-wide democracy [18]. The merit of political identity lies in creating a sense of belonging, as well as in cooperation, loyalty, stability and social solidarity. The political identity formed in the context of civic nationalism is flexible and, therefore, capable of covering many different political views and of being open to cultural pluralism ([19], pp. 49–64). Thus, since the development of political identity through the education system is necessary, this identity should be based on law, reason and political values. The viewpoint has been expressed that an ethnocentric curriculum is only legitimate as a response to the *nation at risk* theory, which

creates a general impression of the nation-state in economic decline [20]. To provide a brief definition of Citizenship Education, one could say that Citizenship Education is education provided to school-age people which involves the systematic cultivation of political values and the study of social and political institutions, with the ultimate goal of developing autonomous and democratic personalities ([21], pp. 16–26).

Competencies required for democratic life include values, skills, knowledge, critical understanding and attitudes. It is referred to the ability of applying learning outcomes adequately in a defined context, not limited to cognitive elements and encompasses functional aspects and ethical values [22].

Competences need to be practiced, not only taught theoretically. The area of competence is defined as a combination of knowledge, skills and attitudes appropriate to the context. The European Framework on Key Competences for democratic culture, emphasise,

- knowledge about democracy, justice, law, justice, the nature of the law, civil and political rights history, socio-political events of the day;

- skills for engaging effectively with others, problem solving in the community, decision making, critical and creative thinking;

- attitudes and values related to respect for human rights, equality and democracy, sense of belonging locally, belonging to the country, willingness to participate in democratic decision-making, respect for the set of values necessary for social cohesion, sustainable development [23].

Based on what has been mentioned so far, we can summarise that citizenship education cultivates political values, constructs specific social knowledge and is implemented by democratic teaching strategies. In terms of political values, citizenship education includes universal human values such as democracy, autonomy, equality, freedom, identity, rights, responsibility, justice, respect, tolerance, freedom of speech and the right to be heard.

In recent decades, sustainability has emerged as a contemporary political value, whose meaning does not only concern the protection of the natural environment but extends beyond it, to the coexistence of humans and the environment, to North–South relations and the exhaustion of natural resources, to the emergence of new forms of poverty and racism and to the justice of nature. All this has raised concerns about whether or not humankind has respected the natural environment and its balance, and today, seeing the impasse, views are being expressed regarding the development of justice of nature [24]. The very fact is that all the categories of rights were institutionalised with a man-centred approach. Social, political and human rights were all institutionalised in relation to humans, nature was taken for granted and sustainable, but it seems that it was not.

Citizenship education knowledge focuses on humanity's social achievements, the way of social and political organisation, issues of power, pressure groups, global organisations, polities and contents of social studies. On the basis of the new political value, the value of sustainability, the knowledge content of civic education refers to the interactive relationship between human beings and natural environment and the value of a righteous coexistence that does not unfairly harm any category of people, races and nations, but also natural ecosystems. Such an approach extends the content of citizenship education from the local and national to the global and cosmopolitan environment.

Regarding teaching strategies, citizenship education is understood as a democratic pedagogical praxis, which is developed with actively involved students, where teachers do not consider themselves as the authority of knowledge, as they explore and learn together with students. Teachers have the role of facilitator and orchestrator of pedagogical praxis, while ensuring that pedagogical action takes place in the community and the school operates as a civil society. In order to be able to approach it properly and to teach relevant political issues, educators should receive extensive training in subjects pertaining to the social sciences. Citizenship education should focus more on reality and experience than on knowledge accumulation. As Dubet states, it should cultivate the capacity to learn and not just content knowledge aquisition, and to be directed towards discovering the common ethnic culture, over and over again, in a world that is open and diverse [25].

To sum up, Citizenship Education is characterised by an interest in developing autonomous and democratic personalities in young individuals, awareness of their responsibilities, acknowledgment of their rights, promotion of respect for, tolerance and solidarity to their fellow humans, and compliance with the law and the conventions of the political entity (state or federation) which provides them with citizenship, i.e. with the property which grants them the right to act as political beings in the context of democratic political institutions.

3. Sustainability and global citizenship

> *'…the first environmental crisis is the potential collapse of the natural world … the second environmental crisis is the removal of children from the natural world'*
>
> *George Monbi*

In today's rapidly changing global landscape, the individual is called upon to manage with a fresh, flexible and original look his/her private spacetime and the daily change of this. Contemporary challenges humankind has to address are the question of coexistence, staking the survival of the species, new complex problems, e.g., pandemics and environmental pollution. These challenges transcend national borders and lead to the need for global awareness and the identity of global citizenship. Sustainability is emerging as a contemporary political value. It engages every field of the human community, science, politics and society. International organisations have released proposals for sustainable policies, scientists are researching the challenges related to sustainability and education seeks to cultivate values, skills and attitudes for sustainable behaviour in students. Such behaviour is based not only on respect for people but also for ecosystems and nature as a whole. In the undisputed universal human and political values, the value of sustainability is projected as the supreme imperative, which man should not ignore.

Global Citizenship Identity focuses on the development of active and democratic citizens who are characterised by global consciousness, a shared understanding of current humanity issues and a strong interest in providing solutions. UNESCO identifies Global Citizenship as 'a sense of belonging to a broader community and common humanity. It emphasizes political, economic, social and cultural interdependency and interconnectedness between the local, the national and the global' ([7], p. 14). Global citizenship education '…is used as an "umbrella term" covering themes such as education for tolerance and appreciation of diversity, conflict resolution and peace, humanitarian action and introduction to the principles of human rights and humanitarian

law, as well as civic responsibilities,—as these themes relate to local, national and international levels' ([18], p. 9). As regards global orientation of education, aims to empower learners to engage in active roles locally, nationally and globally, to face global challenges and sustainable world.

Comparing the identity of citizenship in the past with this of nowadays, citizens had only the identity of their state whereas today there are many elements that define citizenship and define many identities. This is the right way to construct global citizenship as identity, an identity that defines the relationship to others. Also, rather than being linked to a kind of institutionalisation, the concept of global citizenship refers solely to global citizenship as identity. This makes the concept of global citizenship as an identity more rooted in the realities of international relations than its concept as an institution [26].

Sustainability means enduring into the long-term future; it refers to systems and processes that are able to operate and persist on their own over long periods of time. 'The adjective "sustainable" means "able to continue without interruption" or "able to endure without failing." The word "sustainability" comes from the Latin verb sustinēre, "to maintain, sustain, support, endure", made from the roots sub, "up from below" and tenēre, "to hold" ([27], p. 3).'

Sustainability refers to three dimensions, Environment—Ecological sustainability, Economics—Economic potential and Equity—Social inclusion. These three dimensions—environment, economy and equity—are sometimes called the 'triple bottom line' (TBL), a term introduced in 1997 by corporate responsibility expert John Elkington ([28], pp. 18–22). They are referred to as the 'three E's' and are also known as the three pillars of sustainability or 'planet, people and prosperity' [29]. Sustainability science is a field of study devoted to tackling the challenges of sustainable development in the transition towards sustainability. This field is interdisciplinary, 'defined by the problems it addresses rather than by the disciplines it employs' ([30], p. 26). The concept of sustainability has a dynamic rather than a static meaning, which promotes the continuous cultural and social change for development of global solidarity and justice [31].

UNESCO has encouraged national government agencies, transnational and nongovernmental organisations and teachers and researchers to pursue various policies, programs and pedagogies to foster and further develop global citizenship education. The United Nations in 2015 defined 17 Sustainable Development Goals (SDG) to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda, and they must be achieved by 2030. According to the UN Secretary-General Ban Ki-moon, the SDGs are a to-do list for people and planet, and a blueprint for success. The goals address the needs of people in both developed and developing countries, emphasising that no one should be left behind. Broad and ambitious in scope, the agenda addresses the three dimensions of sustainable development: social, economic and environmental, as well as important aspects related to peace, justice and effective institutions [29].

Three dimensions occur by the SDGs, ecological sustainability, social and cultural sustainability and economic sustainability. In social and ecological systems, modularity means that groups of parts are strongly connected internally, but only loosely connected to other groups. The parts of a resilient system are connected, although not in a predictable, linear way. When one module fails, others keep functioning and the larger system has a chance to self-organise ([32], p. 121). For example, a local food system is a module that may also be connected with national and global food sources, but when there is a disruption in the larger distribution chain, people in

the community can keep growing food and are less likely to go hungry. Whether in ecosystems, such as forests or oceans, or in social systems, such as cities or nations, the more diverse a system is and the more variations there are, the better that system will be able to deal with change and stay resilient. Diversity gives system flexibility; it has multiple ways to perform its functions, so the failure of one part does not cause the entire system to crash ([33], p. 355). This definition emphasises the global perspective. It also recognises economic and cultural diversity, in terms of needs as well as in terms of contexts for interpretation and implementation of the goals set out in the report.

4. Curriculum for sustainable development

The Sustainable Development Goal 4 on Quality Education asks Member States to ensure that all learners acquire values, attitudes and behaviours to promote sustainable development, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development [29].

Curriculum refers to the overall process of developing, selecting, promoting and evaluating learning contents [34]. On the basis of this term, education is understood as a mechanism that promotes and organises matters related to knowledge. As far as the subject of Citizenship Education is concerned, it is crucial that educators are free to improvise. A closed curriculum would deprive Citizenship Education of its inherent vitality. In contrast, an open curriculum allows teachers to undertake initiative. However, it should be borne in mind that for an open curriculum to be efficient it is vital that educators receive full scientific training in pedagogy and that they be aware of and familiar with themes of social and political science.

The 3Rs literacy was instrumental, not substantial at its core. Writing, reading and arithmetic are tools for approaching knowledge. The question is what knowledge is being promoted for the education of young people and in what ways is it being promoted? Citizens need tools, but first of all they need knowledge about the world around them, human and natural. What exists in the environment, how societies are constituted, how people function and what is the role of the individual both in relation to social action and to the environment. In contemporary curricula, citizenship education is encountered either as a cross-curricular objective or as a distinct school subject. In the former case, citizenship is thought to be promoted by all subjects and by the educational process as a whole. As a consequence, citizenship education is only mentioned in the curriculum as one of its general principles. In the latter case, it is believed that a cross-curricular objective does not suffice to achieve the specific goals of citizenship education. It is, therefore, necessary to apply specialised instruction and to bring children into contact with appropriately designed material.

Education for Sustainable Development, part and parcel of Target 4.7, empowers learners to take informed decisions and responsible action for environmental integrity, economic viability and just society for present and future generations, while respecting cultural diversity. In Oxfam, the philosophy of global citizenship is implemented through a whole-school approach, which involves everyone from learners themselves to the wider community. In this way, global citizenship education creates a culture of global knowledge about other societies, thus instilling tolerance and emphasising the importance of collective power for responsibility [35].

Democratically-oriented curricula develop knowledge, skills and habits that promote civic values [36, 37]. Designing a curriculum that can lead to the establishment

of a global citizenship identity is the desideratum. The traditional curricula, promoting the 3Rs, do not seem to suffice to respond to current challenges. What we need is to seek new ideas that can contribute to sustainable development on multiple levels. According to Reimers, the content of such a curriculum should place emphasis on environmental studies, world history and public health. In addition, educators must address the range of skills that global competency requires [38]. Re-examining literacy is a continuous process emerging from social needs and scientific progress. Welch and Freebody showed that each and every era and society undergoes its own literacy crisis [39].

Educators are the main supporters of citizenship and sustainable development education. Given that democratic citizenship is built both through social interaction and through syllabuses and circulars, and that educators are entrusted with the task of applying and developing the moral, mental and learning objectives of specialised activities, their contribution to building a democratic political identity and global consciousness is invaluable. However, the work they are entrusted with is ambiguous in nature. Educators work in the context of educational institutions, and are, therefore, an essential link in the process of producing and spreading scientific knowledge. Their work, however, is not as easy as it may seem. Phillips stresses that teachers are major role models for others and that, because of this, students' preparation for democratic civic participation is more likely to succeed when the autonomy model endorsed is a democratic one. He stresses that the likelihood of democratic autonomy and participation exists where the processes of analysis, judgement and dialogue are at the core of professional training [40]. Educators develop their educational strategies based on their personal theory and oral competencies. Students, in their effort to construct meaning and learn, are directly influenced by the way in which educators manage orality. The genuine dialogue in learning process is highly valuable ([41], pp. 231–247).

4.1 Natural environment and education

> *'What they do not know, they will not protect, and what they do not protect, they will lose'*
>
> *Charles Jordan*

Just as in order for young citizens to tolerate and respect other cultures they need to become acquainted with and interact with individuals of other cultural identities, similarly, in order to understand the wealth of the natural environment they need to become familiar with it and aware of its benefits. Plato in his fundamental work *Politeia* stressed, do not force the children in their lessons, but cultivate them by playing, so that they may rather have their own way as long as each one has the dynamic to be. Jean-Jacques Rousseau, in his work *Émile*, stresses that nature and the immediate environment are the sources of knowledge for the child. For John Dewey, the environment and the child's drive for life take a primary place in the New Education.

Environmental education supports many areas of development. Contact with nature is important for children's development in all areas: physical, emotional, social and cognitive [42]. It enhances cognitive abilities and promotes creativity and problem-solving. Surveys of children in schoolyards found that children engage in more creative forms of play in green spaces ([43], pp. 311–330). Nature play is particularly important for skill development, creativity, problem solving and intellectual development [42]. It also improves nutrition. Children who grow their own food are

more likely to eat fruits and vegetables [44], show higher levels of knowledge about nutrition, and are more likely to continue healthy eating habits ([45], pp. 91–93). It has benefits for the visual sense. More time spent outdoors is associated with reduced myopia rates, especially in children and adolescents [46]. Access to green spaces and even views of greenery enhance calmness, self-control and self-discipline, particularly in girls ([47], pp. 1580–1586).

Mousena and Sidiropoulou investigated the views and attitudes of parents of infants residing in the capital city of Athens regarding the phenomenon of children's removal from the natural environment and the disorder caused by Nature Deficit Disorder ([48], pp. 11–18). The results showed that parents are not sufficiently aware that their children's limited contact with nature causes problems. Mostly they appear surprised at the vision problems. Also, patents adopt in about 10% the view that bad weather conditions should minimise children's playground time. The frequency of teachers' responses is interesting. The most important research finding is that, although in Greece the climate and the natural environment favour outdoor activities, parents of young citizens act restrictively for them.

According to the findings of another research, parents consider environmental protection as a necessary condition for improving the quality of life, and they accept environmental awareness as a particularly important factor in shaping children's character [49]. Also, they acknowledge the contribution of environmental education in kindergartens and consider that they themselves, through their actions, are the ones who help their children to develop environment-friendly attitudes. But there is a discrepancy between parents' words and actions as they state that they do not participate in voluntary tree planting, do not seek out shops that promote recycling programs and do not use public transport. Finally, the research data suggest that although parents believe that raising children's awareness of environmental protection issues should be more of a concern for parents and educators, cooperation between them and teachers on environmental education activities is almost non-existent.

Richard Louv, in his book, *Last Child in the Woods*, describes the cost of human alienation from nature. It is manifested by limited use of the senses, difficulty in paying attention and higher rates of physical and emotional illness. According to him, for the new generation, nature is more of an abstraction than a reality. Increasingly nature is becoming something we watch, consume, wear and ignore. Also, the new age and urban development limits play in nature and combined with a hard-wired culture keeps children confined to the home [50]. The term Nature Deficit Disorder (NDD) does not refer to a developmental disorder, as listed in the International Statistical Classification of Diseases and Related Health Problems (ICD-10) or the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), but to the phenomenon of human withdrawal from nature, which causes various developmental problems in children, such as vision problems, obesity and an unwillingness to take initiatives or risks.

The methods proposed for a kind of teaching that promotes environmental education and addresses the SDGs are characterised by critical thinking, experiential and exploratory learning, a holistic approach and authentic learning situations in open spaces, as well as by the involvement, apart from the teacher, of a team of experts. Such methods include Philosophy for Children, Enquiry-Based Learning, Systems Thinking, Project-based Learning, Mantle of the Expert and Open Spaces for Dialogue and Enquiry methodology [51].

In order to bring schools closer to the concept of citizenship and sustainability, it is necessary to define them as public spaces that aim to reintroduce the idea of critical

democracy and community. As Henry Giroux stresses, the best way to conceive of the school is as a 'public space', as the centre of citizenship. By public space we mean a tangible set of learning conditions where people come together to talk, engage in dialogue, share their stories and struggle together in a context of social relations that not only do not weaken but enhance the potential for active participation in the public sphere [52].

Civil society, historically, imposed new themes on ecology, environmental threats, feminism, etc., which were the focus of non-centrally institutionalised debates. The role of civil society proved to be decisive in the public framing of many new issues, which went from being part of alternative and marginal debates to becoming elements of the political discourse. Civil society seems not only to be a second society of dissent and opposition but also to sometimes co-shape political publicity and influence the political system in modern democracies [53].

Making school a civil society forum leads to the constitution of a space and a vision that offers alternative ways of seeing and understanding the student, the educator and the school institution. A forum is a podium and a field for the articulation of ideas and the formulation of problems and requests. A space for negotiation and sharing of aspects and views. Fora give space for active citizenship to participate in collective actions. Democracy has inherent dynamic elements, it is not a commodity that you acquire and rest, but it needs constant vigilance to be maintained. Democracy keeps always a promise 'to come' [54]. A place where children and adults participate in projects of political, economic and cultural importance, really this can be seen as such a forum. We need to understand the power that this space has, that it is a central cell of society. Around the young citizens and around the school institutions, there are many other systems, so we need to understand the power of this space and thus orient ourselves towards its new role.

5. Conclusion

Citizenship and sustainability are main goals for schooling in the 21st century. The plethora of questions about citizenship education and sustainability were impossible to be answered in this chapter. In this text, we have analysed the concepts of citizenship and sustainability, in the spirit of promoting the sustainable development goals, in order to highlight specific issues of their implementation in the school curriculum and teaching strategies. Citizenship education is a highly dynamic subject, which is of concern to the academic community and to education policymakers in every country and internationally. Citizenship is a subject that refers to the education of people to become citizens, to learn to govern and be governed.

Citizenship education concerns values, democracy, autonomy, peace, equality, freedom, collective action, dialogue, communication, recognition, rights, participation, tolerance and respect, empathy, responsibility, autonomy, cultural pluralism, problem solving, decision making, critical thinking, democratic dialogue, openness, transparency, sharing and publicity.

Education for citizenship is a basic purpose of educational systems, which has been linked to the formation and functioning of the nation state, and as a result, an ideologically ethnocentric curriculum has been promoted. However, in the era of globalisation and the contemporary problems of humanity, which transcend national borders, it follows that citizenship education should have a transnational orientation and a cosmopolitan content.

The sustainable development goals set all the parameters for the functioning of societies with a perspective of continuity, both of the institutional achievements of humanity and of the adequacy of the natural environment. Historically, the acquisition of citizenship has required significant ideas, thoughts, struggles, negotiations and institutionalisation. The political constitution of society and the functioning of democracy is both an achievement and a perpetual goal. These are not taken for granted and conquered at once. It is highly doubtful that they are to be considered as conquests that have been established forever. Democracy is not conquered all at once, as it is not a concrete and immutable form of government, it is a constitution that is based on fundamental political values. Democracy is an ideal constantly imminent, 'to come', as Derrida has pointed out. To safeguard the institutional achievements of humanity, there is no other way than to educate the new generation in democracy and the value of citizenship.

A 4Cs curriculum that could be drawn up to serve this purpose would be one that would provide for the following:

Civic and Political Values: The cultivation of civic and political values to be the ideological basis of the program.

Critical Pedagogy and Social Sciences: Critical pedagogy as a discipline and social studies is the appropriate conceptual framework for the study and formation of citizenship.

Civil Society: From a methodological point of view, the function of the school as a forum of civil society can promote the above-mentioned purpose in a creative, critical and open-minded way. With this pedagogical strategy, there will be no exclusions or divisions between us and the others, between insiders and outsiders, the teacher and the pupils, promoting pedagogy in the community. In such a logic without dualisms, knowledge is co-produced participatively, power is shared and responsibility and autonomy are promoted.

Competent Professionals: Initial training and continuing professional development of teachers is essential to ensure that teachers' professional competencies are adequate to meet the demands of building citizenship in students in an increasingly changing and globalised world.

Author details
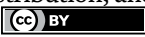
Eleni Mousena[1]*, Trifeni Sidiropoulou[1] and Maretta Sidiropoulou[2]

1 University of West Attica, Athens, Greece

2 Democritus University of Thrace, Greece

*Address all correspondence to: mousenaeleni@yahoo.gr

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The Researcher's Role: An Intervention Study Using Lesson Study in Norway

Kåre Hauge

Abstract

The aim of the study has been to investigate the researcher's role in an intervention study using Lesson Study as a mediating artifact for teachers' professional development. The research question addressed in this article is: "How can the researcher act and react to the challenges that emerge when enhancing the development of practice and still allow teachers to own and manage the project"? An argument for this study is that there are several studies that point out that the researcher's role in intervention research in which teachers and researchers cooperate are of great importance. At the same time, little research describes the researcher's role and function during a research project. This article describes and explores the researcher's role in facing challenges in a practice-oriented intervention during the study. This study lasted for a period of two years. To answer the research question, I have used several data sources to get a holistic picture of the researcher role. Data sources consist of interviews, teacher's reflection notes, research log and observations. This study verifies that the researcher's role and approach are of crucial importance for change and development.

Keywords: researchers' role, intervention study, Lesson Study, CHAT (cultural historical activity history)

1. Introduction

Several countries have invested considerably in teachers' professional development [1]. To date, professional development for teachers has been largely based on formal approaches, such as professional development programs, mentoring, courses and workshops, and introductions to new methods and techniques [1–3]. According to Opfer and Pedder [4], formal approaches that are characterized by isolated events do not give due consideration to the fact that teachers' professional development is part of a complex system that encompasses individual teachers, interactions between multiple teachers, school systems, and teachers' dealings with them. In the field of research and development work in schools, interactions between teachers, school management, interventions and often external researchers, must also be considered, adding another layer of complexity to the system overall. Recent research has indicated that both schools and teachers strive to facilitate constructive and meaningful inter-teacher interactions that will promote teachers' development within this complex system ([5–7]; Norwegian [8]).

Studies have also demonstrated that, despite increased interest in collective learning and the popularity of collaboration between teachers, few changes have been implemented in practice and major revisions are rarely enacted [5, 9, 10].

An expert group on the teacher's role [11] appointed by the Norwegian Ministry of Education, particularly recommended that researchers and teachers should cooperate more closely on research and development work aimed at improving of schools and teaching practices. The group also emphasized the necessity of strengthening the role of research in the organization of teachers' workloads and in cooperative activities among teachers. While a more robust culture of research collaboration between researchers and practitioners is undoubtedly a priority, Norway's Ministry of Education [8] noted a dearth in researchers with sufficient expertise. This is supported by Nilsson and Postholm [12], who have found that there are too few researchers and teacher educators in Norway with the necessary competence to conduct research based on development processes. This is also supported by Tan [13] who believes that the challenge posed by the lack of researchers with the relevant expertise is also an international problem. Insufficient consideration has been afforded to the quality of the researcher's role by policymakers and education experts who front the agenda and promote teachers' professional development [13].

This article focuses on a practice-oriented intervention study in which the researcher and the participating teachers collaborated with the aim of improving teaching practice to optimize students' outcomes. The study's primary objective was to investigate the researcher's role in intervention research of this nature, and Lesson Study (LS) was the method used to structure and organize the developmental work. Burner [14] emphasizes that intervention means disrupting teachers' existing practice in some way or other and points out that researchers must be mindful and considerate of this. In intervention research that involves collaboration between teachers and researchers, the researcher must consider two types of reflexivity [15]: epistemological reflexivity wherein the researcher considers their own values and understandings, and methodological reflexivity wherein the researchers evaluate their own impact on their respective fields of practice.

The study was carried out from September 2015 to April 2017 at a small Norwegian school that covers grades 1 to 10 (students' ages ranged from 6 to 15 years). For the purposes of the study, the teachers were organized into six teams, four at the elementary level and two at the secondary level, and all teachers at the school participated in the LS project. My focus in this study was on the researcher's role (i.e., my role) in working with the two secondary teams.

My research question was as follows: *How do the researcher act and react to the challenges that emerge when enhancing the development of practice and still allow teachers to own and manage the project?* To answer this question, I will describe and analyze how I (the researcher) dealt with the challenges and opportunities that arose, with the aim of providing a thinking tool for other researchers in similar projects. Before presenting my findings, I will describe the theoretical and methodological framework used and how I, as a researcher, behaved during the study. Finally, I will analyze my findings in the light of relevant theoretical perspectives and research that supports these findings. First, LS is introduced briefly below.

1.1 Introduction to lesson study

Lesson Study (LS) is a method aimed at enhancing teaching and building pedagogical knowledge involves a group of teachers who wants to improve aspects of their

teaching and to optimize their students' learning experiences [16–18]. LS is a classroom inquiry method in which a group of teachers meet regularly to collaborate regarded to planning and teaching and to share observations, reflections and analysis related to their teaching and students' learning experiences. In LS, teachers assume an active role in exploring and refining their lessons for improved teaching and learning [19]. Lewis, Perry, and Murata [20] emphasize that LS processes are largely owned and led by the participants, in that they are practice-oriented, school-based, and facilitate the sharing and building of knowledge. The notion that LS are owned and led by the teachers is contestable: Takahashi and McDougal [21] claims that in Japan, where the LS method was originally developed, LS always includes a researcher or an external *knowledgeable other* who participates as a facilitator to support the process and to challenge the teachers. Most LS projects outside Japan are executed by teachers without the participation of researchers or *knowledgeable others* [21]. Takahashi [22] insist, however, that studies implementing the LS method require an external researcher or *knowledgeable other* who can: (1) provide access to a deeper understanding of the content the teachers are investigating and, (2) offer perspectives on the LS work and process that differ from those of the teachers. Takahashi [22] also emphasizes how important it is for researchers to assist others in learning how to reflect on teaching and learning.

The overall focus of the LS groups in this study was related to challenges facing teachers with regard to students' writing in various subjects. An overall goal was that teachers should augment their knowledge of teaching and their understanding of students to improve their teaching practices through collective development processes. Lewis [17] asserts that knowledge acquisition with regard to students' thinking and learning process and ways of improving teaching practice are two essential principles of the LS method.

2. Theoretical framework

Cultural historical activity theory (CHAT) was adopted as the theoretical foundation and framework for this research. Intervention studies based on CHAT aim to promote changes in practice by means of interventions that create new content in various parts of the activity system [23]. The researcher's role in interventions based on CHAT is to promote and maintain an expansive learning process led and owned by the teachers ([24], p. 15). Research that adopts a CHAT approach, therefore, examines participants' interactions and social constructions, and aims to improve practice while the research is being conducted [25, 26]. It is important that the researcher enter the field with a reflexive approach; this requires the ability to reflect introspectively on his or her own values, thoughts, and actions and to modify these in accordance with the field of practice [15]. In qualitative research, a process wherein the researcher reflects on his or her own role is described as a *reflexive process* [15, 27, 28].

The researcher (myself) and teachers (participants) involved in this research shared the objective of developing the teachers' teaching practice and cooperated toward common purpose of building knowledge, enhancing teaching, and optimizing student learning. However, a researcher may be confronted with various challenges in collaboration with teachers with regard to fundamental pedagogical perspectives, the establishment of trust between participants in the community, cooperation between teachers, the intervention itself, different perspectives on approaches to professional development, and research and development processes that need to be addressed [22, 26, 29]. Intervention research and development work conducted within the

CHAT framework always constitutes a dialog between the researcher and participants [24], meaning that it is neither the researcher nor the participants alone who set the guidelines for the process. The focus and direction of the work is determined in dialogs between the researcher and the participants, and, therefore, it is crucial that meaningful dialogs are created and maintained among the research community. In this study, participants actively explored and researched their own practices, though they were not characterized as researchers.

In any given activity system (in this context, the school), the community is likely to hold different views and divergent interests, which may give rise to tensions and contradictions [30]. CHAT is a dialectical theory, and the dialectical terms "tensions" and "contradictions" are crucial [24]. According to Engeström [30], tensions and contradictions are potential sources of change and transformation. Vygotsky [31], on whose thoughts and ideas CHAT builds, emphasized the use of language as a mediating artifact, as when teachers plan or reflect cooperatively. In the context of individual learning, Vygotsky introduced the concepts of the *actual development zone* (ADZ) and the *zone of proximal development* (ZPD). The ADZ defines what a person thinks and does alone, whereas the ZPD represents the difference between what a person can do alone and what he or she can do with the help of a competent other. Engeström [32] adapted Vygotsky's individually oriented concept of the ZPD to promote collective activity to a greater extent, seeing it as "the distance between the present everyday actions of the individual and the historical new form of the societal actions that can be collectively generated" ([32], p. 174). The researcher's role is to promote and maintain an expansive transformation process that is led and owned by the teachers ([24], p. 15) and, together with the participants in the project, to be a competent other. This relates to Takahasi's [22] emphasis on the important role of the researcher or *the knowledgeable other* in interactions of this nature, wherein the researcher supports the teachers' work by encouraging what they are doing well, asking questions and by challenging them with other perspectives and critical thinking.

Engeström [33] demonstrated how colleagues can develop and generate new learning conditions together by adopting an inquiry-based approach. He subsequently linked this to the concept of *expansive learning.* This requires teachers in professional learning communities to be willing to investigate their own practices with the aim of exploring and developing *something that is not yet there* ([24], p. 2). Fundamental to the LS method is the exploration of challenges and problems related both to teaching and the students' experiences. LS aims to better understand and resolve the challenges that teaching practice presents [20, 21]. Experimentation with new teaching methods in response to challenges and problems is key to improving teaching; the focus is on developing practices that are *not yet there.* In this way, CHAT and expansive learning together form the overarching framework, while LS functions as a mediating artifact for learning and teachers' professional development.

3. The researcher's role

3.1 Related research

In an action research study Postholm and Skrøvset [34] emphasized the importance of the researcher's reflections on their own role during the research period. They described three factors that are of particular relevance to the present study. First, they pointed to the importance of the researcher having communication skills and

an attitude that signals symmetry with the participants; this is crucial for creating and maintaining a research community. Second, they focused on the importance of the researcher's ability to redefine their own role and to adjust content and direction during the research period; this can for example, mean that an ongoing project may be steered in unexpected directions or that teachers' desires may change mid-process. The third important factor is the researcher's awareness of the need to establish complementary relationships and trust among the participants. Hargreaves [35] observes that it is only when the participants trust the researcher that they feel emboldened enough to raise questions and voice thoughts without experiencing concern that their professionalism, competence, or knowledge is being called into question.

In a study combining LS and microteaching, Fernandez [36] emphasized the importance of the researcher's ability and willingness to support and challenge teachers in processes of analysis and reflection related to their practice. Fernandez [36] also highlights the researcher's role in maintaining focus on the overarching goal as well as the researcher's ability to collaborate with the participants in a way that ensures both parties, (i.e. researcher and teachers) learn within the project. In a study concerned with teachers' learning processes, Tan [13] focuses on the researcher's ability to encourage new ways of thinking about teaching and learning and new approaches to organizing and enacting teaching. Tan also believes that policymakers afford insufficient attention to the quality of the researchers who front the agenda for promoting teachers' professional development, claiming that the researcher's role is often taken for granted [13]. In a collaborative project between researchers and teachers, Jung and Brady [37] identified the importance of the researcher's ability to launch the discussion within the research community and to address teachers' concerns and challenges.

3.2 The researcher's role in this study

My role as a researcher, as communicated to the teachers in this study, was to lend support and be a driving force in the developmental processes. This necessitated finding a balance between the need to provide support and the need to drive the process forward, while ensuring that the project was managed and owned by the teachers [22]. I was, therefore, concerned not only with understanding the social interactions and the social structures among the participants, but I also shared with the teachers' aspiration that the project would contribute to improvements in their practice.

As a researcher, being a participant observer in the various LS processes gave me opportunities to gain a broader insight into the teachers' thoughts about teaching and about the challenges they experienced in their practice. Through critical reflective thinking and by challenging the teachers' "commonsense" beliefs about teaching [15], I could seek to promote and maintain an expansive transformation process [24]. Given my own professional background (I was a teacher for several years), I was also aware that I was entering a field of research and practice with which I am familiar.

4. Methodology

This paper reports a qualitative study that focuses on the researcher's role during development work with teachers. Overall, this is an ethnographic study that is aimed at understanding the teachers' learning culture and the ways in which it may be developed. I have examined my own role as a researcher to address the study's primary research question. This approach required an interrogation of the researcher's role.

Considering my role as a case study or a self-study, I determined that the situation corresponded to what Stake [38] described as an intrinsic case study; that is, the case itself was of primary interest, and I needed to learn more about the particular case in point, namely the researcher's role. Yin [39] emphasized that a case study is an empirical inquiry that investigates by addressing the "how" and "why" questions concerning the phenomenon of interest. Data collection in case studies and self-studies is often extensive and draws on multiple sources to from a comprehensive picture of the topic at hand [40].

4.1 Data collection

The data collection process in this study took the form of participation in 15 planning meetings and 15 reflection talks, 2 group interviews with the teacher teams (at the project's culmination), and the completion of 40 individual reflection notes by the teachers. Throughout the study, I wrote a research log focusing on my role as researcher. I also had several informal conversations with the teachers, and relevant material concerning the researcher's role from those conversations has been included in the research log.

In this study, I have work with and collaborated with two teacher teams consisting of five teachers on each team, a total of 10 teachers. Among the participants in the study, there were two men and eight women. The one with longest experience as a teacher had worked as a teacher for 35 years and the one with the least experience had worked as a teacher for two years. **Table 1** shows an overview of the participants in the study. Many of the participants had previous experience with professional development work and projects in school, while some had little experience related to such work. The table also shows how many planning- and reflection conversations the participants participated in during the study.

Participation in planning and reflection meetings gave me valuable insight into what the teachers discussed and how they discussed it. This allowed me to formulate further thoughts about how I, in my capacity as researcher, could both support and challenge them in their efforts to establish and maintain an expansive transformation process [24]. The interviews gave me the opportunity to question the participants

Participant	Years as a teacher	Participation in planning and reflection talks
Man	8 years	15
Woman	18 years	15
Woman	27 years	13
Woman	2 years	13
Woman	35 years	14
Woman	15 years	11
Man	9 years	15
Woman	16 years	13
Woman	33 years	14
Woman	13 years	12

Table 1.
Overview of the participants in the study.

specifically about their perception of the researcher's role and the importance of collaborating with a researcher. I adopted a semi-structured format for the interviews [41, 42], and conducted them as an academic conversation where the researcher's role had a central focus. The objective of the interviews was to gain access to the participants' perspectives on the researcher's role and the importance of cooperating with a researcher in developing their knowledge and learning. I also wished to capture critical perspectives on how the researcher's role could have been improved and adjusted in this project. These perspectives laid the foundation for developing questions and topics for the interviews.

From the teachers' individual reflection notes, I gained insight into their personal thoughts about collaborating with a researcher and the influence it had on their learning and development. The research log became a tool for understanding my own role and permitted me to adopt a meta-perspective on the research process and on my role as a researcher. Since the study is a study of my role as a researcher, the researcher log is an important data source in this study.

All meetings and interviews were audio-recorded, and I personally transcribed the interviews verbatim. Parts of the meetings containing material pertaining to the researcher's role were also transcribed. The study thus generated large amounts of data from multiple sources, as was necessary to assemble as much information as possible about the researcher's role.

4.2 Data analysis

In addition to exploring and understanding the researcher's role, it was my goal that the project should contribute to developing the teachers' practice. It was therefore necessary to analyze the data continuously throughout the collection process. This gave me the opportunity to form an overview of the project in its entirety and to monitor my own role to ascertain where and how I could support and challenge the teachers in subsequent development work. It was also important to capture the participants' own interpretations and opinions about the researcher's role in the project (the emic perspective) [42, 43], as these perspectives had the potential to inform and enrich my own interpretation. To this end, I also collected the teachers' individual reflection notes throughout the project. This allowed me to form a more holistic perspective on the researcher's role and informed me in designing approaches for sustaining the project's learning and development direction.

To develop a structure for the material, I used the open coding phase described by Strauss and Corbin [44] in the constant comparative method of analysis. In the open coding phase, the data are studied and compared, and categorized according to specific terms [45]. The analytical work commenced with the transcribing of the recordings from the planning meetings and reflection talks. This process gave me an overview of how the teachers were addressing the challenges facing them. Furthermore, I gained some insight into how the teachers were collaborating, what they were discussing, and, not least, how they discussed. To capture a holistic view of the researcher's role, my logbook entries and the teachers' reflection notes were important sources. In moving back and forth between these three data sources, which became the most salient sources in the course of the study, I laid the groundwork for how I, as a researcher, perceived the challenges facing us and how we could work with them. The interviews were also useful in evaluating the researcher's role, but because their value came to light at the project's culmination, they served as secondary sources.

During the process of coding and categorizing the data, some challenges arose in relation to the researcher's role, which have been grouped into the following categories: (1) creating deliberative processes; (2) creating justifications and arguments for actions; and (3) creating exploratory dialogs in cooperation with the teachers. To ensure the quality of the data used, I applied "member-checking" as described by Lincoln and Guba [46], where I continuously analyzed the collected data and presented them to the participants to check whether they matched their experiences and perceptions. These member-checks also helped to ensure the quality of the study. Participation was based on informed consent, and the article complies with the ethical principle of participant anonymity [47]. Consequently, none of the teachers is named.

5. Findings

Within the overall frame of the main research question, the three challenge categories mentioned above are used to structure the presentation of the findings related to the researcher's role. I will present those findings in the current section and elucidate them in the analysis and discussion section. Quotations from my research log and statements from teachers are numbered, and I refer back to them in the analysis and discussion section.

5.1 Challenge 1: creating deliberative processes

LS as a framework is time-consuming for teachers. If teachers are to work thoroughly in accordance with the various LS processes, it is important that the school management devote sufficient time to the work. In this study, the school management adapted well and planned for the teachers to have the time that they needed. As a result, the first challenge that arose was, unexpectedly, a challenge for me rather than for the teachers. At the end of the first LS cycle, the teachers informed me that the time allowed for preparation, for analyzing the challenge, and for planning the research lesson was too much and that they would probably be able to complete it in half the time. In sifting through the data, I found that the teachers had not sufficiently highlighted the challenges from various perspectives. Factors related to the challenge—such as what the challenge consists of, when and for whom it is a challenge, what the current situation is, and what the desired outcome is—were not discussed thoroughly. This finding forced me to reflect on how the development work might best be taken forward, and in my research log, I wrote:

> I had thought that the teachers had sufficient knowledge of analyzing and exploring their own practices. When my observations and analyses reveal something to contradict this, I question the effects of LS, one of the main tasks of which is to explore, reflect on, and analyze the challenges of one's own practice thoroughly. When teachers lack this competence, it is here that we must begin. This competence needs to be strengthened. (Research log, 1)

I was fully aware that I had identified something that I felt was lacking in the teachers' practices and that I had touched on an important part of their work. Prior to the study, I had visited the school several times to plan the project and to become acquainted with and establish a relationship of trust with the teachers. Therefore, it

was important for me to consider carefully how to convey to them what had emerged from the preliminary analysis. I wrote in my log:

> *I know that in order to drive development I have to challenge the teachers on what I perceived as weaknesses in their practice. At the same time, I am afraid to break down the mutual trust we have gained … If I had been one of the teachers, I would also want to hear about what was positive. (Research log, 2)*

In this quote from my log, it is clear that there were tensions to resolve with respect to how the findings should be presented to the participants. In reflecting on this, I used myself as an example, as I attempted to gain insight into the participants' point of view: How would I have reacted to being told this?

In a group interview in the middle of the study, I asked the teachers how they perceived the way I, as a researcher, presented the preliminary findings. These were the responses from two of the teachers:

1. You give us a lot of praise and express the positive aspects of what we are doing well, but you also ask critical questions. I feel you are concerned about everything we do, not just what we can be improved, and it builds trust …

2. … and by starting with the good points, we can handle the critical inputs more constructively, and your honesty in your feedback builds trust. (Group interview, 1)

When we discussed why the planning phase lacked the thoroughness that is essential for fully addressing the challenges, the teachers felt that there were various reasons. Two of them had this to say:

1. Maybe it's too much for us at the same time, both thorough analyses of challenges and thinking in a new way or creating something new … both are unfamiliar to us.

2. We are more comfortable using methods and activities of which we have experience, and we may need more knowledge or skills to plan in this new way. (Meeting, 1)

The teachers were honest and open in this discussion which laid a foundation for deeper and more thorough planning that we could develop and strengthen in cooperation. To sustain this mutual trust, it was important that I maintain awareness of the approaches that could help strengthen the planning process. The comment reported above, that two new things at the same time could be too much, also provided an opportunity to reflect on how to take the process forward:

> *I must be aware that we have to think and do things gradually, and that development and change takes time and cannot be expected to occur within a short period of time. (Research log, 3)*

As researcher, it challenged me both emotionally and cognitively to point out deficiencies in the ways in which the teachers had analyzed the challenges: emotionally, because I had addressed and pointed out weaknesses in their practice and, cognitively, because these are demanding processes to go through and I (we) had to

find approaches that could create meaningful and evolving dialogs. While this was demanding and difficult for the teachers, they also expressed the view that an analytic and exploratory approach to the challenges laid a foundation for learning and development. As one teacher stated in a planning meeting:

> *We have never worked in this way with challenges before. Challenges have previously been discussed there and then in a simple way without us having gained a better understanding of them or solved them. However, to really get into them and work with them has been very meaningful and has clarified for me that parts of my practice must be changed. (Meeting, 2).*

This statement indicates that, prior to the study, the teachers had lacked experience in applying thorough analysis and exploratory conversations to challenges that they faced.

5.2 Challenge 2: creating justifications and arguments for action

This category of challenge was probably not experienced by the teachers themselves as a difficulty that they encountered in their practice. It is a challenge that I identified, but, in my opinion, it represents a crucial element in teachers' learning. Although the teachers had begun to develop a more thorough analytical process, I observed a lack of justification and argumentation for actions in their teaching. In planning meetings and planning documents, there was little justification of practice, and it was clear from observing their teaching that the specific teaching activities related to the challenges were inadequate in addressing the complexities involved. Here, they largely discussed what actions they should choose, with less focus on why and how these specific actions would support the students' learning. This was particularly challenging for me, since it appeared that I had identified a weakness in the teachers' approach to their students. This approach lies at the core teaching, and it was inevitable that they must be challenged further on this point. At the same time, however, I was unsure how they perceived my reflections, and consequently I undertook several rounds of thinking and reflection before I presented my feedback to them. In my research log, I wrote:

> *I know that, from my point of view, I am touching a core function when it comes to the practice of the teaching profession, but do the teachers feel the same? However, I must be honest with both the participants and myself so I must address this somehow. How should I present it? How will the teachers react? What have the teachers done before, and what knowledge do they have that can be built on? Which approaches are most likely to be beneficial and meaningful to the teachers in the process of developing justification? (Research log, 4)*

During my reflection process, I was constantly aware of the need to avoid presenting what I perceived as a lack in the teachers' practice as mistakes or weaknesses in their thinking and teaching. I focused, therefore, on determining and building a constructive approach to the development of justifications by asking questions, supporting the teachers, and cooperating with them.

Although the teachers found it tough to have their practice scrutinized, they were also clear that they valued my honesty and that I pointed out potential issues. As one of them stated in an interview:

> *We are so accustomed to our culture and ways of doing things that we do not see what we can do differently. Therefore, it is necessary that someone should come from outside who can see things with new perspectives and who is interested in working together with us. (Group interview, 2)*

5.3 Challenge 3: creating exploratory dialogs in cooperation with the teachers

The following statement appeared in one of the interviews midway through the study:

> *Pedagogical discussions and meetings are important to us, but they rarely have a clear agenda or goal. We meet and talk about what we need there and then, occasionally as a debrief, occasionally as planning. We generally share ideas, support each other, and are not critical of others' ideas. The problem is that we tend to lose focus and start talking about other things. (Group interview, 3)*

As somebody who taught for many years this statement did not surprise me. In this regard, another finding from this category—one that emerged during informal one-to-one dialogs with participants, is particularly interesting. During these conversations, the teachers asked more questions and shared thoughts, ideas, and new perspectives that had not arisen during planning meetings or in reflection talks between teachers.

Compared with the two previous challenges, this challenge was easier to handle. In this case, the challenge did not derive from any lack or weakness in the participants' knowledge; rather, knowledge and thoughts had emerged in one context that had remained unspoken in another context. In my research log, I wrote:

> *It is clear that teachers have knowledge and perspectives that do not emerge in teacher conversations. Could there be anything in the school's culture that compromises the trust between teachers? Is it a culture that simply prioritizes a nice time at work and agreement on most issues? Are teachers afraid to voice their opinions to other teachers? What has created this culture? (Research log, 5)*

The research log was my tool for reflection, wherein I could outline several possible reasons for the phenomenon and devise possible solutions. This time, however, I wished to push the teachers further to identify their own reasons and solutions, because I perceived this as a positive finding and felt encouraged to challenge them more. After presenting my findings, I asked the teachers, "Why do different knowledge and different perspectives emerge in conversations with me but not in talks between teachers?" In discussion, the teachers pointed to several factors:

1. In conversations with you [the researcher], I can say what I want and I can discuss the topic without anxiety about how others look at me. I trust you.

2. When you [the researcher] are here, we become more serious and we take the work more seriously, and you are honest with feedback and asking curious questions.

3. We have a good social environment and trust each other socially, but maybe we do not experience the same security or trust and confidence when discussing pedagogical and professional issues. (Meeting, 3)

These statements from the teachers were valuable to me as a researcher, and they became important for our subsequent collaboration. None of them mentioned that they lacked the knowledge necessary to enter into pedagogical discussions. The issues they raised concerned perceived lack of security and trust, lack of confidence, and a desire for colleagues to ask questions and be honest. In the research log, I wrote:

> *I have visited the school often and invested a lot of time in building trust and open-ness. I made a conscious effort to praise what should be praised and, although it has been challenging, I have the courage to challenge the teachers where necessary ... One does not engage in challenging dialogs if there is no trust present. A sense of security is necessary to negotiate the unknown. (Research log, 6)*

6. Analysis and discussion

This study shows that cooperative research and development work between researchers and teachers is challenging and demanding but that also offer opportunities for both parties to learn and develop. The study's focus has been on how the researcher can act and react to challenges and opportunities that emerge during teaching practice development, while still allowing teachers to own and manage the project. Below, I discuss four factors that emerged as important across all categories presented in the findings section.

6.1 Creating and maintaining trust

Discussions and reflections concerning trust between the researcher and teachers arose in several contexts during the study. Although I was conscious of the need to establish relationships of trust in advance of and during the study, reflections, questions, and challenges related to trust recurred throughout the study, both for myself as a researcher and for the participants. The concept of trust and confidence was also identified by Stenhouse [48] as a possible barrier to teachers' professional development and learning. The findings from this study indicate that it is challenging for the researcher to determine a suitable approach to creating relationships of trust and that this requires the researcher to be able to reflect on his or her own role through reflexive processes [15, 27, 28]. In an effort to create and maintain trust and open relationships among the participants and between the participants and myself, the study's findings clearly attest to the tensions and contradictions associated with these processes [24]. With regard to both developing the teachers' practices and developing and understanding my role as a researcher, it was crucial to actively engage with these tensions and establish from where they derive, describe what they are about, and to take stock of my own values and how I sensitively treated them. These processes comprise what Steen-Olsen [15] describe as the researcher's epistemological reflexivity. The tensions that arose in the study, related to trust, thorough dialog and justifications for action, became valuable contributors to change and knowledge building during the process of negotiating these tensions [24].

Based on my reflections in the research log (see Research log, 1) and statements from the participants (see Group interview, 1) it appears that trust and honesty between researcher and participants are important for both parties, and both parties must work to establish and maintain them throughout the project. Participants clearly indicated that the researcher's ability to provide positive feedback and to

identify and highlight the positive aspects of their practice helped to established trust (see Group interview, 1). They also pointed to the importance of the researcher expressing interest in their practice generally and not just in the areas requiring improvement Takahashi [22]. My curiosity regarding several areas of each teacher's practice was valuable, therefore, in that it offered a better opportunity to modify the teacher's existing approaches and to find ways of negotiating challenges that were in line with his or her level of development. We were thus able to collaboratively devise approaches to challenges that helped to expand the teacher's individual development zone, as described by Vygotsky [31], and also to create meaningful collective processes [32]. My reflections between Meeting 1 and Meeting 2 indicate that the researcher plays a significant role in creating meaningful collective processes that generate what Engeström [33] describes as expansive transformational processes or expansive learning, which are major functions of the researcher's role within the CHAT framework [24]. This finding also attests the importance of the researcher's methodological reflexivity [15].

If projects executed within the LS framework are to drive change and development in practice, teachers must be able to engage in deliberative processes and adopt a critical view of their own practices [20, 49]. During the first half of the study, dialogs between the teachers demonstrated that these qualities were lacking. I was confident that this was due to a lack of knowledge and experience as to how such processes should work.

6.2 Presenting findings to the participants

According to Schön [50], it is by discovering weaknesses and deficiencies in the ways in which we do things that we create opportunities for learning and development. When I identified weaknesses in a teacher's approach to a challenge, two particular factors emerged as important. First, the findings had to be presented in a way that created meaning and understanding among the teachers but that also demonstrated how they might have gained more insight into the challenge by adopting an improved approach Takahashi [22]. In my log (Research log, 4), I reflected on the weaknesses that I discovered with respect to justifications and argumentation for teachers' actions. The most demanding aspect of this was not identifying the shortcomings but finding a good approach to present them so that they might benefit the participants. This demonstrates how tensions can arise in the activity system, in the meeting between challenges and how to respond to them [24]. While attempting to predict how the teachers might react, I was also obliged to reflect thoroughly on what the next step in the development process might be. The extract from my research log describes some of this reflexive process, and demonstrates that the researcher must reflect on and address various challenges simultaneously. Second, it was important that I signal my interest in learning more about the challenge, in creating development, and in improving collaboration with the teachers. The participants appreciated the fact that I adopted this approach when communicating my findings (see Group interview, 2). Their stated responses verify that they trusted me and welcomed my support, which underlines the importance of the researcher having the courage to challenge the teachers by questioning their existing practices.

Another important point that emerged from the stated responses is how important it is to the participants that the researcher not only points out shortcomings but also plays an active part in the developmental process. Fernandez [36] also emphasizes the importance of the researcher's ability and willingness to contribute to learning and

development. Takahashi [22] is clear that an important part of the researcher's role is to support teachers by asking questions and challenging them with critical thinking and new perspectives. To ensure that my questions and critical input were meaningful for the teachers, I had to ascertain how the teachers were thinking and acting in relation to the challenges they faced. To develop their thinking and practice, I had to assess their current levels of knowledge and awareness; that is, I had to determine their *actual development level* [31]. If the researcher or the *knowledgeable other* is to be able to communicate effectively with the teachers, they must know the teachers and adjust the content and progression of development in accordance with their level of knowledge Takahashi [22]. The teachers' stated responses (see Group interview, 2) highlight the importance of the external perspective offered by the researcher who can perceive aspects of a teacher's practice that are difficult to detect from the inside. A study by Somekh [51] attests that teachers find it difficult to objectively perceive the culture they are immersed in, which also makes it challenging for them to identify where and how changes might be made.

6.3 Enabling thorough discussions and exploratory dialogs between teachers

While the teachers in this study acknowledge the importance of pedagogical discussion and professional meetings, they also found that the meetings lacked structure and failed to focus on the topic at hand. My experiences of meetings and dialogs between the teachers corroborated this. I also observed that dialogs between the teachers seemed to be cumulative in their effect [52], in that participants largely confirmed what others had said, building on it in positive but uncritical ways.

My initial thought was that a way to carry out planning meetings and reflection talks that moved beyond the cumulative level should be identified. Jung and Brady [37] emphasize the importance of the researcher's ability to instigate discussions and reflections, but do not offer suggestions as to how the researcher might support and develop the discussions. However, during informal one-to-one conversations, it was clear that several participants were in fact already capable of moving beyond the cumulative level, but between researcher and teacher, informal dialogs were more exploratory [52]. According to Lewis et al. [20], thorough discussions and reflections are important for continuing the LS process and they have a significant impact on teachers' learning and development. In research log 1, I reflected on the lack of thorough exploratory discussions between the teachers, and initially concluded that their competence in that area needed to be strengthened using a theoretically focused approach. However, through informal conversations between the teachers and myself it became apparent that the teachers already had the required knowledge and competence and that the lack of thorough exploratory discussions was due to other factors. The theoretical approach I had been considering was therefore inappropriate and would have been insufficient to meet the needs of the teachers at that time. This is supported by Postholm and Skrøvset [34] who point out that if theory and theoretical perspectives are not introduced at the appropriate time, they may in fact be counterproductive. In this case, the fostering of thorough discussion and reflection became a practical challenge.

Kemmis [53] use the term "praxis" (p. 465), which in this context is understood as a dialectical process in which teachers can change teaching and teaching can change teachers, emphasizing that praxis includes "sayings, doings and relatings", with a focus on how an educator might act wisely. These human activities are in turn formed by historical and cultural conditions. In this context, "sayings" are understood as

the content of the dialogs and reflections, and an important task was to focus on penetrating further into the content as basis for a broader understanding of the challenges facing the teachers. This in turn may lead to improved teaching practices: that is, teachers' "doings". Rather than adopting a theoretical approach, we had to approach the challenge practically and consider how we might practically strengthen the dialogs and reflections so that they might become more deliberative and critical. By adopting a historical and cultural analytic perspective on the dialogs between the participants in the study, which is fundamental to CHAT, we could cooperatively devise a new way of structuring the dialogs, which in turn helped to generate new content in various aspects of the activity system [24].

These considerations bring us back to the question of trust, this time to the professional trust between teachers (Meeting, 3). It became clear that there was an issue of weak professional trust between them (Meeting, 3), as well as the difficulties presented by the unfamiliar approach and their lack of experience. This is supported by Postholm and Skrøvset [34], who emphasize the importance of the researcher's awareness of the relationships and trust levels between the teachers which have two dimensions: social and academic/professional. The participants in this study had a good social environment and high levels of social trust in one another, but that degree of trust was absent from their pedagogical and professional discussions. Rather than building theoretical competence, we therefore had to begin by building professional trust.

To this end, it was necessary to adopt an approach that allowed the teachers to test their perceptions and understanding of challenges within an environment of mutual trust. It proved helpful in this regard to refer to Schön's [50] conception of *reflective practice.* We began with a thorough analysis of the challenge, designing elucidatory questions such as the following: When is it a challenge, and to whom? What does it consist of? What experiences can we relate to it? What factors could sustain it? What is the current situation? What is the desired outcome? In this process, we devised the questions together, but it was up to the teachers to delve into them in greater detail and to bring forward different perspectives and interpretations. The teachers thus had significant involvement in designing the approach and adapting it to the subsequent process. This allowed them to address the challenges in a more reflective way and created what Eraut [54] describes as deliberative processes. In turn, meaningful deliberative processes between the teachers laid the foundation for expansive learning and enhancement of their individual development zones [24].

It was difficult to strike a balance between supporting the teachers and challenging them. To strike this balance, it was necessary for me to become well acquainted with the participants and to spend sufficient time with them in their field of practice. I visited the research school often, and participated in discussions, dialogs, observations, and informal meetings. Language thus became an important mediating artifact [31] for creating meaning and common understanding between us. This formed a good basis for striking the necessary balance and for facilitating subsequent processes in the project.

6.4 The researcher's practical wisdom and pedagogical/professional discretion

In pursuit of the balance between supporting and challenging teachers, another aspect, which was present in all the challenge categories mentioned above, affected me as a researcher. Several studies have focused on teachers' practical wisdom and pedagogical discretion [54, 55]. However, in respect of formative intervention

research [24] and the researcher's role, this theme has received little attention. Although I gleaned a lot of information about the balance from the data I collected, many of my actions and approaches were based on practical wisdom and pedagogical discretion rather than on the data alone. As a researcher and initiator, I was also conscious of my responsibility to lead the project in a direction that would encourage learning and development, although the project was largely teacher-led. With this responsibility come certain expectations, from both the researcher and from the teachers, and it was necessary for me to make some decisions based partly on past experience, partly on theoretical considerations, and partly on practical wisdom and pedagogical discretion. Within the CHAT paradigm, tensions and contradictions are acknowledged as playing an important role as a starting point for development [24] but, from a researcher's perspective, one can never predict what new tensions and contradictions will emerge after those already detected have resolved. I was therefore obliged to make decisions continually.

7. Conclusion

Although LS is a method that is largely teacher-led, the findings of this study attest the need for researchers / external interveners to support and strengthen LS development work in a direction that promotes learning. This study corroborates findings from previous research, concerning the importance of the researcher's abilities to communicate, to redefine his or her own role, to collaborate with the participants in ways that facilitate learning for all parties, and to encourage new ways of thinking about teaching and learning.

The present study indicates that it is unrealistic to simply, implement LS as a mediating artifact for teachers' learning and development and to expect expansive learning to occur as an automatic result. By examining the researcher's role in research within LS, this study both clarifies that role and highlights the challenges the researcher is likely to encounter within LS. LS entails processes that are demanding and comprehensive for teachers, and it requires them to have the necessary skills and knowledge to exercise thorough analysis and reflection. Unlike several of the research projects mentioned above, which indicate the importance of the researcher's role, this study not only highlights the challenges that emerged, but also describes how the researcher reacts and responds to these challenges. The researcher's thoughts and actions related to these challenges have received relatively little exploration. This study will provide the research field and researchers with useful information concerning how the researcher might act and react, and will therefore be an important contribution to researchers' development of useful and necessary competence, as advocated by Nilsson and Postholm [12]. The study clarifies that the researcher's role in practically oriented research is a challenging one that requires competence in several areas. Notably, this applies to the type of research that the expert group for teachers' roles (2016) called for, in which the goal is to contribute to teachers' learning and development and to encourage changes in teaching practices. This study also verifies that the researcher's role and approach are of crucial importance for change and development, and that the reflexive researcher intervenes in such a way that an approach that is at once challenging and supportive helps to reduce the complexity of teachers' professional development, as described by Opfer and Pedder [4]. Further research on the researcher's role in LS and in similar research projects is, therefore, recommended.

Author details

Kåre Hauge
NTNU, Norwegian University of Science and Technology, Trondheim, Norway

*Address all correspondence to: kare.hauge@ntnu.no

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Chapter 3

Need for Enriching School Principal Training Programs in Light of Total Quality Management - A Case of Turkey

Hülya Şenol and Serdal Işiktaş

Abstract

School principals are expected to carry out many duties such as realizing the strategic aims, mission, and vision of the schools, maximizing school performance, maintaining discipline in schools and have many skills and knowledge in management processes. In preschool settings, principals need more training and have understanding of early child education because they have influence on teachers, students, and school context. That's why quality of principal training programs is very crucial for school progression. This research aimed to determine and analyze the principal qualification requirements of preschools in Turkey. The results of this research will help universities to enrich their education management master and PhD degree programs and contribute to the General Directorate of Teacher Training and Development in Turkey during the organization process of the Education Management Certificate Program to meet the principal qualification requirements of preschools.

Keywords: education management, preschool, principal qualifications, principal training, total quality management

1. Introduction

School principals are expected to carry out many duties such as realizing the strategic aims, mission, and vision of the school, maximizing school performance, maintaining discipline, facilitating human relations, evaluation and conciliation in schools and have many skills and knowledge in laws and rules of Ministry of Education, management processes and practices, group dynamics, content of the curricula, program evaluation and development [1, 2]. School leaders and their preparation have impact on school quality and school outcomes. Principals have influence on teachers, student achievement, and school context so that they need knowledge and understanding of early child education [3, 4]. If the principals get more training in early childhood, they feel more confident in supervision of the prekindergartens [5]. In this sense, principal preparation programs are very important aspect of school development and progression [6].

When the regulations prepared for the recruitment of school administrators in Turkey before 2021 are examined, it is seen that to be successful in the selection exam for the appointment of school administrators, having minimum 3 years of experience as a teacher, not having received disciplinary penalty and good seniority characteristics are seen to come to the forefront. There was no mandatory training program or in-service course that school principals had to attend in order to be appointed. However, in order to train school principals who want to improve themselves academically, universities (through postgraduate study programs), Institute of Public Administration of Turkey and the Middle East (through TODAİE Specialization Program), and National Ministry of Education (in-service training activities) were trying to provide the necessary support to the teachers. With the amendment made in the Regulation on Selecting and Assigning Administrators to schools affiliated to the Ministry of National Education, training to get Educational Management Certificate was made compulsory for candidates who want to be appointed as principal or assistant principals in educational institutions on February 2021 [7]. The following general conditions are sought for those who will be appointed as school principal: having undergraduate degree, working as a teacher in the Ministry staff, getting Education Management Certificate, and being successful in the oral and written exams specified in this Regulation in terms of those who will be appointed to the management for the first time.

Written exam topics and weights are:

a. General culture: 20%.

b. Atatürk's principles and revolution history: 10%.

c. Values education: 10%.

d. Ethics in education and training: 10%.

e. Educational sciences: 30%.

f. Legislation 20%.

Oral exam topics and weights are.

a. Written exam subjects (legislation and general culture): 20%,

b. Comprehending and summarizing a topic, ability to express, and judgment: 20%,

c. Representation ability, merit, attitude, and behavior suitability for the task: 20%,

d. Self-confidence, ability to persuade, and persuasiveness: 20%,

e. Openness to scientific and technological developments: 20%.

The principal candidates can attend to the education management certificate program within the scope of distance or face-to-face education. The content of the education management certificate program includes

- Introduction to education management.

- Functions and features of educational institutions.

- Instructor management 1: recruitment, distribution of duties, and motivation.

- Instructor management 2: professional development, observation, performance evaluation, and feedback.

- Quality curriculum management and accreditation.

- Project management and change.

- Financial considerations.

The Educational Administration Certificate will be valid for 8 years from the year following the date of receipt. Those who currently serve as administrators in schools will continue to do so until their 4-year assignment ends. Candidates who want to apply for a second 4-year assignment from these people will need to attend the education management certificate program before the end of their first 4-year term successfully complete the training and get the certificate. The managerial duties of the principals who did not participate in the Education Management Certificate Program and those who did not succeed will end at the end of the 4-year period. Necessary arrangements and organization process for the Education Management Certificate Program are still in progress. Also, having a master degree or PhD degree in educational administration will contribute to final selection process of the principals with extra point advantage.

In order to graduate from the Educational Administration Master's Program of a university in Turkey, students must

- receive seven courses with a minimum of 21 credits (at least two compulsory courses), one "Seminar" course, "Research Methods and Scientific Ethics" course (**Tables 1** and **2**).

- defend their thesis works successfully.

- be successful in all courses with at least a CB degree, have taken a minimum of 120 ECTS credits, and have a Weighted Cumulative Grade Point Average of at least 2.50/4.00.

Course name	Credits
Leadership in educational organizations	3
Organizational behavior	3
Scientific ethic in research methods	2
Seminar	0

Table 1.
Compulsory courses in educational administration master's program.

Turkish Educational System	3	Conflict Management in Educational Organizations	3
Educational Systems in Turkey and EU	3	Educational Discrimination	3
Social Theory and Education	3	Ethic in Education and Instruction	3
Education in Political Theories	3	Equality in Education	3
Performance Evaluation	3	History of Educational Administration in Turkish Educational System	3
Organizational Communication	3	Educational Law	3
Preventive Counseling in Educational Systems and Preservative Factors in Administration	3	New Approaches in Educational Administration	3
School Administration	3	Qualitative Research Methodology	3
School Management	3	Advanced Statistics and Its Applications	3
Human Resources Management	3	Scientific Research Method and Techniques	3
Educational Planning	3	Educational Supervision	3
Total Quality Management in Education	3	Introduction to Educational Administration	3
Curriculum Development and Evaluation in Education	3	Educational Politics	3
Quality Implementation in Education	3	Human Relations in Educational Administration	3
Educational Economy	3	Changing Management in Educational Organizations	3

Table 2.
Elective courses in educational administration master's program.

1.1 Theoretical framework

The total quality management (TQM) is a management philosophy that involves all the shareholders of an organization to produce quality products and services. The thoughts of W. Edwards Deming, Joseph M. Juran, and Philip B. Crosby form the fundamentals of TQM. These researchers conducted their studies in Japan and in the United States about quality control. TQM was developed for business initially, but it has a wide application in education institutions to deliver higher-quality services to students [8, 9]. Top management leadership, responsibility of everyone for quality, avoiding the mistake, not finding fault, making the first attempt right, continuous improvement, improving efficiency, reducing defects and the costs, benchmarking, satisfaction of internal and external customers, concentration on the process, and being scientific are the basic elements of total quality management [10–15]. Involvement of students, instructors, parents, employers, and society as stakeholders of education in continuous development, focusing on their expectations and meeting their needs are essential in total quality management [8, 15]. The application of core principals and processes of total quality management in the process of curriculum development is essential [16]. Education faculties, focusing on quality education can advance the twenty-first-century skills of their graduates and achieve higher success of being preferred by the students.

There are state and private preschools implementing national curriculum and also British, Canadian, and American culture preschools implementing international programs such as bilingual education, Waldorf, European Language Portfolio,

Montessori, Great Explorations in Math and Science (GEMS) in Turkey. The Ministry of Education and the universities should consider the principal qualification requirements of preschools during the process of designing, updating, and developing principal training programs. There is a scarcity of research in the literature about the school principals' recruitment and training in Turkey. The existing ones belong to years before 2018 [17–22]. When the studies on the selection of school administrators in Turkey are examined, it is seen that most of the studies are on the need to improve the implementation of the education system. For this reason, the research studies on the subject have not gone beyond being theoretical.

2. Method

2.1 Aim of the research

This research aimed to determine and analyze the principal qualification requirements of national and international preschools in Turkey such as sociodemographic features, work experience in school management, education level, soft skills, and hard skills.

2.2 Sample

Data were obtained from principal recruitment advertisements of 105 preschools implementing Turkish National Pre-School Curriculum and 15 preschools implementing international programs on the websites of the preschools, on the most popular job search sites, and in newspapers between May 2021 and April 2022.

2.3 Data analysis

The results of this qualitative research were analyzed and interpreted with document analysis method carefully and systematically [23, 24]. All physical documents, existing documents, participant, non-participant observations, and interviews can be analyzed together in the process of document analysis [25].

3. Results

The findings of the research are presented under the categories of principal qualification requirements of the preschools as.

- sociodemographic features,

- work experience,

- education level,

- soft skills and,

- hard skills.

3.1 Sociodemographic features

Results of the data analysis about the sociodemographic features of the principals sought by the preschools showed that both type of preschools implementing Turkish National curriculum and international programs prefer to recruit school principals between ages 25 and 40 (79.17% in total) and both type of preschools accept female or male principals (87.5% in total) (**Table 3**).

3.2 Duration of work experience in school management

Principals having minimum 2–3 years of experience in school management are mostly preferred by the preschools implementing Turkish National curriculum and international programs (**Table 4**).

	Preschools implementing Turkish National Curriculum (n = 105)		Preschools implementing international programs (n = 15)		Total (120)	
	(f)	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**
Age						
25–40	87	**82.86**[*]	8	**53.30**[*]	95	**79.17**[*]
41–65	18	17.14	7	46.7	25	20.83
Gender						
Female	15	14.29	0	0	15	12.5
Male	0	0	0	0	0	0
Female or Male	90	**85.71**[*]	15	**100**[*]	105	**87.5**[*]
* and bold shows the highest values.						

Table 3.
The sociodemographic features of the preschool principals.

	Preschools implementing Turkish National Curriculum (n = 105)		Preschools implementing international programs (n = 15)		Total (120)	
	(f)	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**
Experience Year						
Minimum 2–3 years of management experience at a school of Ministry of Education	69	65.71[*]	8	53.33[*]	77	64.17
4–25 years of management experience	33	31.43	6	40	39	32.5
Not stated	3	2.86	1	6.67	4	3.33
* and bold shows the highest values.						

Table 4.
The work experience of the principals in preschool management.

3.3 Education level

Research analysis showed that both types of preschools prefer to recruit school principals who hold diploma of preschool teaching undergraduate degree and are suitable for appointment criteria of Ministry of Education (87.5% in total) (**Table 5**).

3.4 Soft skills

Analysis of data showed that preschools implementing Turkish National curriculum and international programs expect to recruit school principals having 33 different soft skills. Mostly preferred soft skills of the school principals are having positive energy/being energetic (94.17%), having team management skills (90.83%), being devoted/tolerant/flexible working hours on overtime (86.67%), having management and leadership skills (86.67%), being productive/creative (84.17%), being open to continuous improvement and innovation (80.83%), having strong communication skills (80%), loving and understanding children (79.17%), and having coordination skills (77.5%) (**Table 6**).

3.5 Hard skills

Mostly preferred hard skills of school principals by the preschools implementing Turkish National curricula in order are being able to use computer programs such as MEBBIS, KURUMNET, E-School (100%), having good command of today's educational technologies and computer literacy (98.1%), having good command of Ministry of Education legislation and official procedures (97.14%), knowing contemporary education methods (48.57%), having fluent English (47.62%), having competent

	Preschools implementing Turkish National Curriculum (105)		Preschools implementing international programs (15)		Total (120)	
	(f)	(%)	(f)	(%)	f	%
Education level						
Diploma of Pre-school Teaching Undergraduate Degree and Suitable for MEB appointment criteria	93	88.58[*]	12	80[*]	105	87.5[*]
Diploma of Psychology Undergraduate Degree	6	5.71	0	0	6	5
Postgraduate education (Master / PhD)	6	5.71	2	13.33	8	6.67
Undergraduate Diploma in English Language and Literature, American Language and Literature, English Language Teaching of universities	0	0	1	6.67	1	0.83

* shows the highest values.

Table 5.
The education level of the preschool principals.

	Preschools implementing Turkish National Curriculum (105)		Preschools implementing international programs (15)		Total (120)	
	(f)	**(%)**	**(f)**	**(%)**	**f**	**%**
Soft skills						
1. Management and leadership skills	89	84.76*	15	100*	104	**86.67***
2. Strong representation	27	25.71	0	0	27	22.5
3. Have organizational skills	24	22.86	6	40	30	25
4. Have planning skills	27	25.71	0	0	27	22.5
5. Have coordination skills	81	77.14*	12	80*	93	**77.5***
6. Tracking direction improved	18	17.14	0	0	18	15
7. Can think analytically	30	28.57	9	60*	39	32.5
8. Solution oriented/problem solving skills	27	25.71	11	73.33*	38	31.67
9. Crisis management skills	18	17.14	12	80*	30	25
10. Strong Communication skills	81	77.14 *	15	100 *	96	**80***
11. Persuasion skill	3	2.86	9	60*	12	10
12. Devoted/tolerant/flexible working hours on overtime	90	85.71*	14	93.33*	104	**86.67***
13. Open to continuous improvement and innovation	84	80*	13	86.67*	97	**80.83***
14. Visionary	3	2.86	0	0	3	2.5
15. Have team management skills	96	91.43 *	13	86.67 *	109	**90.83***
16. Achievement-oriented	12	11.43	0	0	12	10
17. With a career plan	41	39.05	8	53.33*	49	40.83
18. Loves the teaching profession	36	34.29	0	0	36	30
19. Loving and understanding children	83	79.05	12	80*	95	**79.17***
20. Productive /creative	91	86.67*	10	66.67*	101	**84.17***
21. That can make empathy	18	17.14	0	0	18	15
22. Thinking fast and making effective decisions	9	8.57	0	0	9	7.5
23. Respectful to herself and her job/work discipline	18	17.14	8	53.33*	26	21.67
24. Loves to share	17	16.19	0	0	17	14.17
25. Genial	15	14.29	0	0	15	12.5
26. Sympathetic	27	25.71	0	0	27	22.5
27. Have positive energy/energetic	98	93.33*	15	100*	113	**94.17***
28. Gives importance to his/her clothing, well-groomed,	29	27.62	9	60*	38	31.67
29. Non smoking	18	17.14	0	0	18	15
30. Good Diction	21	20	0	0	21	17.5
31. Tidy	12	11.43	0	0	12	10
32. Responsible	19	18.10	0	0	19	15.83
33. Have patience	24	22.86	0	0	24	20

* and bold shows the highest values.

Table 6.
Soft skills of principal.

	Preschools implementing Turkish National Curriculum (105)		Preschools implementing international programs (15)		Total (120)	
	(f)	**(%)**	**(f)**	**(%)**	**(f)**	**(%)**
Hard skills						
Fluent English	50	47.62*	9	60*	59	49.17*
Good command of MEB legislation and official procedures	102	97.14*	6	40	108	90*
Good command of international education programs	10	9.52	15	100*	25	20.83
Good command of today's educational technologies and computer literacy	103	98.1*	11	73.33*	114	95*
Competent knowledge in the field behavioral sciences	30	28.57	0	0	30	25
Competent knowledge in the field of developmental psychology	41	39.05	0	0	41	34.17
Knowing contemporary education methods	51	48.57*	13	86.67*	64	53.33*
Able to use MEBBIS, KURUM NET, E-SCHOOL programs	105	100*	0	0	105	87.5*

* shows the highest values.

Table 7.
The hard skills of the preschool principals.

knowledge in the field of developmental psychology (39.05%), and having competent knowledge in the field of behavioral sciences (28.57%) (**Table 7**).

Mostly preferred hard skills of school principals by the preschools implementing International programs in order are having good command of international education programs (100%), knowing contemporary education methods (86.67%), having good command of today's educational technologies and computer literacy (73.33%), having fluent English (60%), and having good command of Ministry of Education legislation and official procedures (40%) (**Table 7**).

4. Discussion and conclusion

Due to the gap in the literature about the school principal qualification requirements of preschools for their recruitment in Turkey, this research aimed to determine the school principal qualification requirements of national and international preschools. Data were obtained from principal recruitment advertisements of 105 preschools implementing Turkish National Pre-School Curriculum and 15 preschools implementing international programs on the websites of the preschools, on the most popular job search sites, and in newspapers between May 2021 and April 2022. The document analysis of the data showed that both type of preschools implementing Turkish National curriculum and international programs prefer to recruit school principals between ages 25 and 40, and they accept applications from female or male candidates. School principals having minimum 2–3 years of experience in school

management and holding diploma of preschool teaching undergraduate degree and suitable for appointment criteria of Ministry of Education are mostly preferred by the preschools.

Preschools implementing Turkish National curriculum and international programs expect to recruit school principals having 33 different soft skills. Mostly preferred soft skills of the school principals are having positive energy/being energetic, having team management skills, being devoted/tolerant/flexible working hours on overtime, having management and leadership skills, being productive/creative, being open to continuous improvement and innovation, having strong communication skills, loving and understanding children, and having coordination skills. Soft skills include emotional intelligence, social skills, communication skills, character traits, interpersonal people skills, attitudes, and career attributes [26]. When the contents of the education management certificate program of Turkish Ministry of Education and the education management master programs offered by the universities (**Tables 1** and **2**) are examined, it is seen that there are no courses fostering the soft skills of the candidate school principals. There are a lot of common problems about the soft skills in different countries [27] such as

- No focus on the development of soft skills and insufficient involvement of the employers during the design of educational programs

- Problem about the evaluation and also observation of soft skills

- The difference between the expectations, demand of the labor market, and the soft skills of graduates

Educational programs have to refocus on development of the soft skills of the graduates [27]. Soft skill development can be infused to the curriculum process of teacher education at the universities [28].

Mostly preferred hard skills of school principals by the preschools implementing Turkish National curriculum in order are being able to use MEBBIS, KURUMNET, E-School programs, having good computer literacy and a command of today's educational technologies, having good command of Ministry of Education legislation and official procedures, knowing contemporary education methods, having fluent English, having competent knowledge in the field of developmental psychology, and having competent knowledge in the field of behavioral sciences. Mostly preferred hard skills of school principals by the preschools implementing International programs in order are having good command of international education programs, knowing contemporary education methods, having a command of today's educational technologies, good computer literacy, fluent English, and good command of Ministry of Education legislation and official procedures. When the contents of the education management certificate program of Turkish Ministry of Education and the education management master programs offered by the universities (**Tables 1** and **2**) are examined, it is seen that there are no courses teaching and improving the knowledge of candidate school principals about the education technologies, international educational programs, English as a foreign language, and developmental psychology in these programs. There are many studies in the literature suggesting the digital leadership and technological knowledge of the school principals to establish and implement technology in their school and become technology leaders to increase the technology literacy and teaching effectiveness of teachers [29, 30]. School principal preparation

programs should address technology leadership so that school principals can be better prepared to implement technology in their schools effectively [31].

Implementing an international curriculum in a school helps students to understand the priorities, characteristics, environmental, health, safety, economic, and political issues of other nations and to gain international mindedness. International mindedness is defined as "the openness and curiosity toward people of the world and other cultures and an effort to reach a deep level of understanding of the complexity and diversity of human interactions." There are many preschools implementing international curricula in Turkey. If the candidate school principals are trained about international education programs, they will find an opportunity to be recruited in an international preschool [32, 33], and also they can foster the academic growth of their students from other countries.

In the globalizing world, the importance given to communication has gradually exceeded national borders. For various reasons such as doing trade, developing tourism, being aware of innovations in the field of education and science, it has become a necessity to learn at least one foreign language for all citizens of the world in order to benefit from the changes and developments in other countries by establishing international relations [34]. English is one of the most widely spoken languages in the world. The English language is becoming increasingly important as a means of communication and interaction between different cultures. School principals who speak English can support and supervise teachers of English language learners effectively, increase their communication with students and their families from different cultures in their schools.

Developmental psychology examines the stages of physical, mental, and social development that occur in prenatal, infancy, childhood, youth, adulthood, and old age. The thought, emotion, and behavior changes that individuals experience throughout their lives and the hereditary or environmental factors that affect these stages are among the main topics of developmental psychology. Training of school principal candidates about developmental psychology will be a factor that facilitates their communication with students, teachers, and parents, understanding their problems and finding solutions to these problems.

5. Further suggestions

On the basis of results of this research, the following suggestions can be made:

- Researchers in other countries can adapt this study to their own country context to find out school principal qualification requirements of the preschools and evaluate the competencies of the school principals, principal assistants, and also the principal candidate teachers based on the expectations of preschools.

- The researchers can do studies with the instructors of educational faculties to determine how to infuse the topic of developing soft skills of graduates into learning programs and education management curricula.

- The Ministry of Education and the universities can add technology, international education programs, English, developmental psychology courses to the curricula of Education management certificate programs and Education Administration postgraduate programs to meet the principal qualification requirements of schools.

Conflict of interest

"The authors declare no conflict of interest."

Author details

Hülya Şenol* and Serdal Işiktaş
Faculty of Social Sciences and Humanities, Cyprus Health and Social Sciences
University, Mersin, Turkey

*Address all correspondence to: hulya.senol@kstu.edu.tr

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Chapter 4

Reflection of Pre-Service ESL Teachers on Using e-Portfolio in Teacher Education

Mahbub Ahsan Khan and Tahmina Hoq

Abstract

Since the last decade of previous millennium e-portfolio has become a frequent topic of discussion in teacher education contexts. It is seen as one of the prominent innovations in educational technology that demonstrates teachers' tangible development of competencies over time. Vast amount of literature is available that document the relative advantages and consequent advocacy for its implementation across disciplines, institutions, and applications. In Malaysia, research on e-portfolio is sparse, and particularly in pre-service teacher education it has never been explored. This article describes the findings of a qualitative study examining fifty-five pre-service ESL teachers' learning experiences while they created e-portfolios as a part of their course requirement at Universiti Sains Malaysia (USM). Data was collected through structured surveys. Findings indicate that most of the participants perceived the process of reflecting on course objectives contributed to their growth and development. Participants also reported several drawbacks of e-portfolios which are required to consider for its successful implementation in teacher education of Malaysia.

Keywords: e-portfolio, pre-service teacher, development of skills, challenges of e-portfolios

1. Introduction

During the last two decades of previous millennium, the world has experienced two significant movements in teacher education. The first is the change in thinking toward alternatives, which bifurcated from the immense dissatisfaction on traditional paper-pencil tests, questionable utility of top-down teaching learning, absolute dependence on quantitative test scores and its inadequacy to assess teachers' actual competencies [1]. The second trend, which is the paradigm shift from teacher-centered to student-centered teaching and learning [2] that came about because of the necessities of functioning in knowledge economy, changing nature of future teachers' roles, obligation of continuous learning and, consequent integration of ICT within curriculum [3]. Both paradigm shifts yielded enormous reforms in teacher education and one of them is the introduction of the 'e-portfolio' as an alternative, useful and meaningful form of learning tool and assessment. Teachers' professional

development endeavor, various documents and learning artifacts can be better managed, organized, documented, and presented in e-portfolios and its benefits to learning including visible learning through written reflection, promising in-depth thinking [4] have accredited the use of e-portfolios. Technologies used in portfolio shares considerably basic characteristics and can vary depending on design, openness, sharing capabilities, and learning curve for usage [5]. Additionally, the level of implementation of e-portfolios and the buy-in from users (i.e., educators, administrators, and students) can differ across institutions. Thus, this widespread and divergent application of e-portfolios requires examination in specific contexts; or else, it may turn into a platform of 'self-advertisement' [6], 'scrapbook of teaching memorabilia' [7] or 'yesterday's unsuccessful idea' [8].

2. Literature review

E-portfolio is a purposeful collection of work, captured by electronic means that exhibits individuals' efforts for learning, reflection, and management of learning artifacts and faculty feedback [9–11]. Kilbane and Milman [12] noted that it must be goal-driven with organized collection of materials which demonstrate expansion of knowledge and skills and can be observed over time. Thereby it allows to figure out artifacts and make connections of reflections supported by peer and instructor feedback [13, 14]. Thus, in line with the objectives of offered face-to-face course or program, teachers can collect, select, reflect, and present professional materials in a pre-determined online platform using multimedia technologies that serves as a mechanism through which educators can facilitate and monitor student learning outcomes [15].

Several researchers advocate introducing e-portfolio for different reasons– easily assessable with the ability to store multiple media and easy to update [16], means to enhance ICT competency [17], promote self-directed [18] and deep learning [19], augment mentoring and e-collaboration boost self-confidence [20] and enhance language and communication skills [16]. It enhances learning by assisting its creators to reconstruct personal teaching practices, reflect on it in multiple learning contexts [20], to document and unfold learning process in the learning experiences [20]. In this new millennium, researchers from this region are becoming compelled by its potentiality. However, the pulsation of e-portfolio has not touched widely in Asia and relatively little is known about its uses. Particularly, in Malaysia, e-portfolio (either paper-based or electronic) is "never been heard of nor reported" ([21], p. 90).

2.1 The study

English is considered as the 'main determinant' of Malaysia's development as it is used as a second language (L2) [22]. Malaysia is one of the Asian countries that is adopting a bilingual system of education [23]. Despite that, daily discussions in print and electronic media indicate a doubtful picture about pre-service ESL teachers' proficiency in English. Such situation demands pre-service ESL teachers' re-skilling or up-skilling of competencies as they are entrusted to transform school students into a knowledge driven society. To give them a meaningful purpose of learning and, utilize, explore, and discover the e-portfolio as an instrument, this study extends the literature on e-portfolio implementation by examining the possibilities and challenges of it to enhance the development and growth among pre-service ESL teachers. Such

an understanding from the perspective of teacher and to improve communication among them develop virtual community of practice [24].

In other words, e-portfolio use date can be pooled to promote quality e-portfolio practice and implementation in higher education. Therefore, the research question, specifically, 'how pre-service ESL teachers perceive e-portfolio for their development and growth' was framed for investigation.

3. Method

55 Pre-service ESL teachers who were majoring in TESOL at the University Sains Malaysia (USM) participated in this study. Participants were randomly divided into nine groups (on average six members in within each group). As a prerequisite, they developed Community of Practice [25] the group members and created individual e-portfolios. The course *PET301* (Teaching of English through Literature) and *Google Group* were considered as the face-to-face and online setting, respectively. They were required to post Weekly Journals (RJ) in line with the course contents (domain). Furthermore, participants (members) were required to engage mutually to look over others' RJs, examine with an eye of criticism, and write critical reflection as Discussion Journals (RJ) mentioning individual opinion (practice). Qualitative data to explore challenges was collected from these sources. One questionnaire was used as a means of collecting quantitative data. It consists of three parts that corresponds to the main aspects of this study including the participants' perspectives toward e-portfolios, its contribution in their development and growth. Moreover, participants' perspectives section has two parts namely purpose of creating e-portfolios and general perspectives toward e-portfolios. Development and growth section were constructed with four sections—language, assessment, learning and pedagogy. Participants were asked to provide responses within a five-point range from 5 (Strongly Agree) to 1 (Strongly Disagree). Reliability of this instrument was established through a pilot study. The Cronbach Alpha is shown in **Table 1** (results of Reliability Analysis) which confirms the issues consist high levels of reliability and are well above the cut-off value of 0.70 as suggested by Nunally [26]. Data was collected at the end of the course and then it was reduced by measuring mean and standard deviation, and afterward, presented in tables and graphs. SPSS (version 12) was used for this.

A lecture session was arranged at the beginning of the semester to orient them with the concept and demonstrate the procedures of creating e-portfolio. For the Internet connection, weekly tutorial sessions (one hour each) were arranged at the computer laboratory. The Course Instructor (CI) played the role of *E-moderator* [27]

	Issues	No of Items	Cronbach Alpha
Perception	General perspective toward e-portfolios	14	.94
Development and growth	Language	06	.94
	Assessment	05	.93
	Learning	06	.91
	Pedagogy	04	.92

Table 1.
Reliability of the instrument.

when participants were making wrong conceptualization or deviating from the main discussion or even when decision-making was required in debatable issues.

Data collection period was limited within one semester (fourteen weeks). Content of the e-portfolios (Reflection Journals) were considered as the source of data. In addition, nine interviews (each from one group) were accomplished for data triangulation and gain insights of interesting or unexpected findings and understand how and why they came to that particular perspective. Participation was voluntary and group members themselves selected their representative for interviews. Data from the interview also served to explore challenges. By examining relevant contents data was organized, broken into manageable units, synthesized, and reduced under different themes. A coding system was used to single out the participants (e.g., A1-- where A refers to the 'Group A' and 1 is the first participant) and data source (RJ refers to the participants' discussion and In for the interviews). For citation, data code and participants' code were used together (e.g., RJF4- reflection journal of fourth participants of group F, InH5- opinion of fifth participant of group H in interview). For qualitative data analysis, as described by Creswell [28], three general processes were followed: preparing and organizing the data, reducing the data into themes and representing data in discussions. Quantitative data of was reduced by measuring mean and presented in tables and graphs.

4. Findings

The survey questionnaire was divided into two sections which are actually in line with the underpinned research questions—participants' perception toward e-portfolios and their development and growth. Perception toward e-portfolios is presented in two parts: firstly, the general perceptions toward e-portfolio (**Figure 1**) and secondly, the perceived development (**Figures 2–4**) and challenges of creating e-portfolio (**Figure 5**).
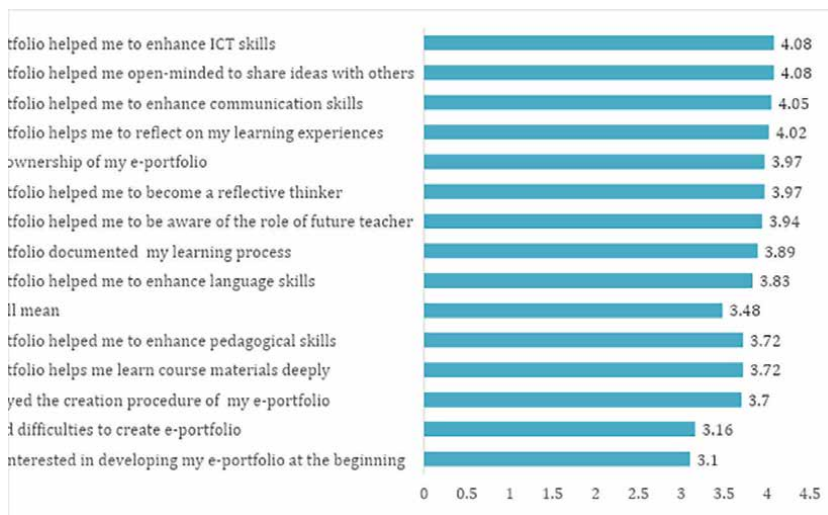
Figure 1.
General perceptions toward e-portfolio.
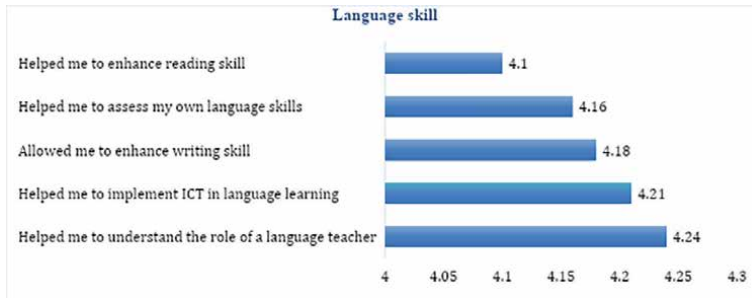
Figure 2.
Development of language skill.
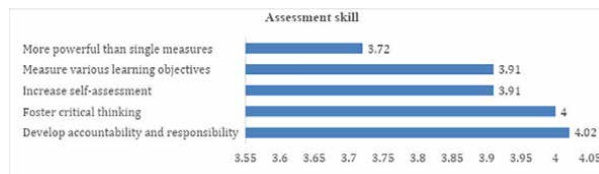
Figure 3.
Development of Assessment skill.
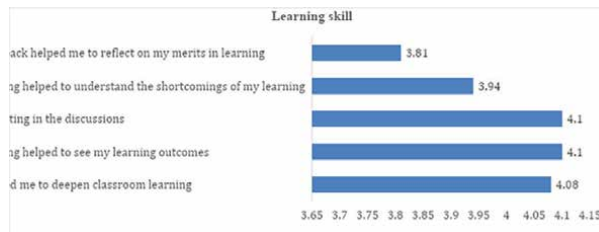
Figure 4.
Development of learning skill.
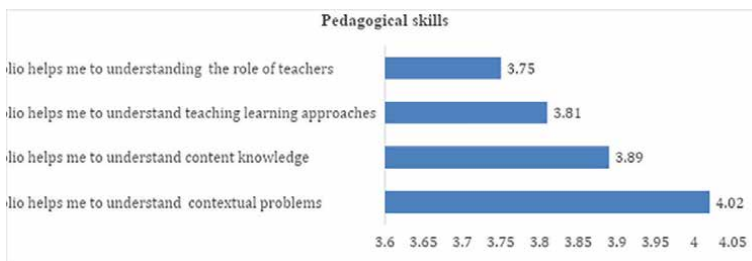
Figure 5.
Development of pedagogical skills.

4.1 General perceptions toward e-portfolio

The **Figure 1** shows the mean score for each of thirteen items which ranged between 3.1 and 4.08. The overall mean 3.48 indicates that participants generally perceived e-portfolios positively. It can be noted that the score in 'enjoyed the creation

procedure' is slightly higher than in 'felt interest'. The mean scores for the responses indicate that pre-service ESL teachers felt comparatively less interested to develop e-portfolios at the beginning (Mean 3.1). From such comparison, it can be assumed that participants felt agony at the early stage due to unfamiliarity with the e-portfolios and difficulties to connect it with the course outline. Moreover, they faced difficulties (Mean 3.16) to create e-portfolio as well. However, they took the e-portfolio project as a challenge, and later, enjoyed the creation procedure (Mean 3.70).

E-portfolios helped them to reflect on their learning experiences (Mean 4.02), share ideas open-mindedly with other participants (Mean 3.94) and, in turn, to become reflective thinker (Mean 3.97). In such way, e-portfolio facilitated the pre-service ESL teachers to learn course materials deeply (Mean 3.72). Data also confirmed that developing e-portfolio enhanced language skills (Mean 3.89), ICT skill (Mean 4.08), communication skill (Mean 4.05) and pedagogical skill (Mean 3.72). E-portfolios were not only considered as a tool for learning but also to document the learning process (Mean 3.89), which made them aware about the readiness as a future teacher (mean 3.94). It resulted in the feeling of ownership among participants (Mean 3.97) after the e-portfolio project was finished.

4.2 Perceived development

Participants claimed that e-portfolio certainly significantly contributed to their language, assessment, learning and pedagogical skills.

4.2.1 Development of language skill

Particularly for the enhancement of linguistic ability, the mean score of participants' responses is more than four in each case (**Figure 2**). Therefore, it can be claimed that creation of e-portfolio allowed the participants to implement ICT in language learning (Mean 4.21) which enhanced their reading (Mean 4.1) and writing skill (Mean 4.18). They were also able to assess their own linguistic ability (Mean 4.16) which led them to understand their role as language teacher (Mean 4.24).

4.2.2 Development of assessment skill

Regarding assessment participants considered e-portfolio as an effective tool as well since it can develop accountability and responsibility (4.02) to measure various learning objectives (Mean 3.91), increase self-assessment (3.91) and critical thinking (4). As such, participants perceived that e-portfolio is more powerful than single measure (Mean 3.72).

4.2.3 Development of Learning skill

During the e-portfolio creation procedure, participants browsed the e-portfolios of most of their classmates (3.56) which helped them to reflect on merits (3.81) or shortcomings (3.94) of postings. Such process gave the participants opportunity to examine individual learning outcomes (Mean 4.1) and later, deepened classroom learning (Mean 4.08). Most importantly, participants enjoyed such learning strategy (Mean 4.1).

4.2.4 Development of pedagogical skill

In addition, it was also supposed that pedagogical skills were enhanced through e-portfolio since assisted them to understand content knowledge (4.08), teaching learning approaches (3.81), contextual problems (4.02) and the role of teachers (3.75).

4.3 Challenges

Apart from the development and growth, participants also claimed that they have faced several challenges to use e-portfolios which include internet connection, workload and time constraint, quality of contribution, and value issues.

4.3.1 Internet connection

Among the challenges, lack of access of Internet connection was identified and opined as the most crucial, because "not all students have computers, needless to say access to the Internet" (RJA2). For example, it was claimed "Internet connection was a big problem", and therefore, "some students might not have the convenience to go online to the website freely" (RJA5). Although participants agreed that it cannot be blamed as the disadvantage of e-portfolio (RJA5), however, for the meaningful execution of any ICT-based appliance these two are the primary requirement (InA2). Such situation hampered the participants to upload their work timely (RJA4) or make e-portfolio going as fluent as they wanted. This was particularly true for the participants who resided in the campus and relied on the wireless connection provided by the University. They argued that CI may think it as a 'dummy excuse', but for them it was 'more than annoying' reality (RJH1). One participant expressed her annoyance "the only challenge that I had is the wireless connection, it is irritating. I was typing so fast and when wanted to post my view the internet connection is gone" (RJA1). To upload the RJs, such situation was endurable since they could "write it down first and then just cut and paste it" when they were online (RJE6). Participants were required to find place to be online (RJB7), awake till midnight to upload materials (RJE6) or even did not depend on the university server (RJC4). Such frustrating situation led them to state "I wish if we can just print all the RJs and save all the disappointment(s)" (RJH3). Such lack of Internet access "definitely reduced interest" (RJC5) and inculcated their enthusiasm to accomplish works through the e-portfolio (RJF1).

4.3.2 Workload and time constraint

Participants revealed time constraint is another challenge to make the e-portfolio effective. Although it was agreed that the "concept of e-portfolio is nice" (RJB7), but 'after several weeks of uploading files, posting RJs and RJs', it was claimed that 'e-portfolio is time consuming phenomenon' (RJA2). One participant explained:

> *I was required to post RJs and RJs on time. To do this, I need to get extra time to post comments and discussions. Besides, e-portfolios require me to do extra research to write. I need extra time to search extra information and complete RJs (RJF1).*

Therefore, using e-portfolios became a durable task as they had to care for other RJs 'with equally heavy workload and mark allocation' (RJA2). One participant stated, "when many assignments to submit I had no free time to open my e-portfolio" (RJI3). Awful internet connection made the process 'tougher and harder' (RJC3). As a result, to "complete the RJs was the big challenge" for them (RJD6). It was argued that the mark allocated for these tasks was comparatively nominal. One participant commented "the workload is quite heavy and time-consuming and deserves more percentage of mark" (RJE2). Under such circumstance it was perceived-- "it was too much to ask everyone to post at least one RJ per week" (RJB7) or "too many things to learn since it is the first time, we exposed to this" (RJG2). Since participants had 'other commitments and workloads' (InG1), quality of writing decrease. Therefore, one participant asserted-- "we had the tendency to just write for the sake of mark not with the willingness to write" (RJD6). Sometimes they "tend to beat around the bush, repeating and paraphrasing what others have said" (RJE1).

4.3.3 Quality of contribution

Participants noticed that because of reluctance or neglecting attitude toward responsibilities, few members remain passive and 'cheat by not contributing at all' or believed that "at least someone will contribute" (RJH3). It was argued that such situation discouraged others' enthusiastic participation. For example, one participant stated "if our comments do not get response from others, it definitely reduces our interest... I felt same when some of my friends did not response to my comments" (RJC5). Moreover, there were students who "do not care about contributing ideas in e-portfolios" (RJF3) or their postings were not valuable for being discussed or debated (RJD6). For example, one participant criticized "many students are not serious when they reply to their comments and just send their comments because they are required to do so" (RJF1) or they tend to "agree and repeat other's points" (RJE6). It was realized that such kind of postings are useless and noted that "higher quantity does not imply decent quality" (RJE6). Hence, participants suggested others to rethink--"am I posting the discussion just for the sake of posting" (RJC4) or "do we tend to emphasize on quantity of posting instead of the quality" (RJE6). However, few reasons were identified in this regard, firstly, there are students who do not have the ability to work independently (RJF3); secondly, they used the same source from Internet to get information (InA2); and thirdly, from the believe that CI would not be able to evaluate the large number of the postings within the time frame (InI4).

4.3.4 Value issues

Plagiarism is another issue that could hinder the quality of the contribution, participants supposed. It was unquestionably agreed that e-portfolio gives students' 'freedom' to use Internet to collect information for educational purposes. But they noticed that "students might use this opportunity to simply copy and paste from the internet and use it as their own" (RJH2). It contradicts with the aim of using e-portfolio and they are 'actually not gaining advantages' from it (RJA4). However, such practice was not acknowledged, rather expressed their frustration "I thought that each and every of them did their job well without plagiarizing. But today I found one of my group mates is guilty... the moment you started reading, you can tell that it was not his work. I am disappointed and feeling sorry for him" (RJB7). Therefore, it was suggested, CI should remain more observant and needs to consider this issue while giving grades (RJA4).

5. Discussion and conclusion

Findings indicate that despite any prior experiences, pre-service ESL teachers perceived e-portfolios as a useful mediator tool to develop a CoP. They employed e-portfolios as the platform to reveal their voices, argue with their individual opinions, encourage others' works and outlooks, and provided suggestion for implication. Initially they took creating e-portfolios as an issue of enjoyable initiative. After becoming familiar with it they started to realize that e-portfolios could be a suitable platform to express their different ideas and individual opinions on an issue which they were not able to apprise in a face-to-face classroom where time and scope are limited. As such, these issues (domains) guided them to organize their knowledge and reflect on that. It helped them sort out what to share, how to distinguish trivial idea and which one had real promise. Such practice dictated them to develop a community within the participants. That is, domain denoted the topic participants focused on, the practice is the specific knowledge the community develops and shares. With the help of the shared practices participants were able to develop a commitment about its use in their future job. Wenger, McDermott and Snyder [29] claim that such commitment make a distinction between a community and just a group of friends. Hence, the pre-service teachers in this study have developed a community of practice and functioned and contributed meaningfully to the causes of their online community, particularly in terms of sharing knowledge.

Findings also reveal that pre-service ESL teachers positively considered e-portfolios as a meaningful tool for the enhancement of competencies. However, similar to the previous studies relating to the pre-service teacher's language [18] and ICT development [16] participants of this study were also feeling frustrated at the beginning due to unfamiliarity with the tasks, later, after becoming confident to deal with, e-portfolios facilitated their development and growth in those areas. This study also corroborates the potentials of e-portfolios to develop an interactive environment for the enhancement of writing skill [30], stimulation of communication skill [16], online collaborative learning [31, 32]. Shy students who felt hesitate to participate in a face-to-face classroom, found it as more suitable way for learning English [18]. It enhanced their insights on drawbacks of traditional paper-pencil tests and developing awareness about the alternative assessment system like e-portfolio. Hence, not surprisingly, most of the participant became aware that this type of tool can contribute to enhancing the teachers' quality in Malaysian, and, therefore, felt motivated to utilize it in their future job. Such psychological advantage may assist them to foster a sense of pride on their personal work and feeling of satisfaction [33]. Such kind of positive feelings is crucial since the use of e-portfolios in educational settings is not a common practice in Malaysia.

Besides this worthwhile and fulfilling learning experience, there are a few drawbacks that need to be addressed. The most damaging issue, if left unattended to is the issue of Internet connection. For the e-portfolios to be successfully implemented, the Internet connection must be available to the participants, fast, consistent, and reliable. Notably, the issue of the online platform is crucial for the successful e-portfolio implementation. Stefani, Masson and Pegler [8] describe four types of commonly used online platform for e-portfolios (1) commercial software (2) institutional (3) open-source e-portfolio software and (4) open-source common tools. This study used open-source e-portfolio software as the online platform. However, each of these options has few pros and cons [8]. Hence, determination is required which type of online platform is more suitable in Malaysian context in line with the expense, participants' capability, and their necessity.

Another concern that was voiced by the participants is the need for a structured and comprehensive training on how to create e-portfolios. Indeed, training is required, since creating e-portfolios is described in literature as a 'daunting job' (Barrett, 2001 cited in [34]) or not a 'simple undertaking' [35]. But before that, policy makers need to take a methodical and organized planning how and for what purposes e-portfolios will be implemented, such as product/ process/showcase, long term/short term (k-12, pre-service, in service), voluntarily/mandatorily, formal accreditation/ informal documentation, institutionally or else as a whole. After addressing such questions training can be arranged to ensure its systematic use. Careful planning is also crucial as the lack of time [36] and redesigning of course objectives in line with the e-portfolios [8] are two seriously hindering factor that could jeopardize the whole initiative. Most importantly, despite ample promise e-portfolios sometimes ends with "limited success" due to "lack of stickiness" ([37], p. xxxiii). Hence, regular updating is imperative to reap the actual benefits from e-portfolios. Course instructors' role is vital in this regard. They are required to provide 'quality and quantity support' ([32], p. 1139) through frequent interaction, recognizing the strengths and weaknesses of individuals, encouraging to constructive use, monitoring participation, and providing formative suggestions.

This study reveals that meaningful utilization of e-portfolios in pre-service teacher education may confer additional dimensions in the efforts of contemporary web-based language learning in Malaysia. It can be a useful tool to enhance ICT competencies, delivering linguistic exercises, access authentic materials, communication, carry out projects, share opinions and ideas, and work in collaborative and co-operative ways among others. However, this study was limited within a narrow context and does not allow for a generalization of findings. But this study provided an important contribution to the literature on e-portfolio since it synthesized the baseline understandings on the issues of pre-service ESL teachers' perceptions toward e-portfolios and how it contributed to their development and growth in a context like Malaysia where using e-portfolio is not a widespread practice. The methodology used in this study can also provide insight to motivate and coach teachers to become more reflective and active participants in their learning processes. Developing countries like Malaysia who are intending to persuade e-portfolios in educational settings may get an insight from this study.

However, it could be noted that, for an extensive implementation such baseline understanding is not sufficient since a lot of issues remained unanswered in this study. New technologies are constantly changing and influence the way we learn and teach. Teachers' capacities to deal with such change, learn from it, and help students learn from it are critical for the future development of societies. Hence, teacher education programs need to adapt the rapid changes of new technologies and stay aligned with contemporary era. Otherwise, such recent technologies may itself create barrier in teachers' development, instead of making them capable. Further research and experimentation in TESOL as well as other contexts and disciplines is required to examine its feasibility and implement process from different views to establish it as a new pedagogical and technological fad in the developing countries as well as in Malaysian context. Since, the present efforts of the governments, in general, are confined to the quality in education, findings from the study may assist the policymakers to initiate necessary steps to reconsider and modify the conventional practices of teaching-learning and assessment. Teacher training institutions can also implement e-portfolios in line with the specific needs in a local context or as a part of certification in not only pre-service but also in-service teacher education.

Author details

Mahbub Ahsan Khan and Tahmina Hoq*
Institute of Education and Research (IER), University of Dhaka, Bangladesh

*Address all correspondence to: tahmina.hoq@du.ac.bd

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Teachers in the 21st Century: Emotional Intelligence Skills Make the Difference

Sabina N. Valente, Abílio A. Lourenço and Sergio Dominguez-Lara

Abstract

Teaching is intrinsically an emotional practice, given the centrality of emotions in the teaching and learning process. That way, teachers in the 21st century increasingly have to have skills for responding to classroom emotional situations. Therefore, the way teachers shape and handle their emotional state and those of their learners is central to educational success. Focused on studies carried out that suggest teachers' emotional intelligence like a success indicator for a healthy pedagogical relationship, this chapter makes a reflective approach to the meaning of teachers' emotional intelligence skills in their professional activity (e.g., professional well-being, teacher-student relationship, and student academic achievement). Consequently, it will be necessary to integrate emotional skills in the pre-service teachers' curriculum as skills needed for teaching practice and also to build capacity and support students during challenging times that constantly changing.

Keywords: teachers', emotional intelligence skills, pedagogical practice, pre-service teachers' training

1. Introduction

In a society marked by the rapid globalization of information and knowledge, anticipating changes in education requires the interpretation of the necessary skills to be developed in teachers, for the benefit of training that meets their needs. To this challenge, others are added, such as the one currently experienced with the COVID-19 pandemic, which, since 2020, has caused changes at a personal, professional, and social level. All these changes require skills from teachers to face the difficulties of new contexts and ensure the success of the teaching and learning process.

Moreover, over the last years, social and emotional skills have been rising on the education policy agenda and in the public debate, specifically to the need to develop these skills in students. In the vision for education future in 2030, the Organization for Economic Cooperation and Development (OECD) views essential learner qualities as the acquisition of skills to embrace complex challenges and the development of the person as a whole, valuing common prosperity, sustainability, and wellbeing [1].

To achieve this vision, a varied set of skills and competencies is needed, that would allow learners to act as "change agents", among which are skills socio and emotional. However, it should be noted that good training of students requires good teachers' training. Teachers are critical to the successful implementation of any new skills development approach, and it is important that teacher training is aware of and responsive to teachers' personal and professional needs in building new skills. In this regard, for a teacher to be effective, their academic training is only complete when they acquire the knowledge that allows them to apply and develop emotional skills in themselves and in their students [2]. But for the majority of teachers, emotional skills development remains a matter of concern, since there is a lack of learning these skills in the academic curricula in teachers' training.

In this sense, it is relevant to emphasize the meaning of teachers' emotional intelligence (EI) skills in the teaching role, since their work requires a high level of sensitivity to their own and their students' emotions. Thus, teachers' EI facilitates an excellent quality of interpersonal relationships, provides a steady and wholesome classroom environment [3], and promotes higher levels of work engagement [4].

Recognizing that teachers' professional performance is controlled by emotional behaviors, as teaching deals with emotional and cognitive, this chapter approaches a set of studies about teachers' EI advantages in the educational context. So, a reflection is made about the relevance of teachers' EI skills in the 21st century. First, a brief reference is made to the role of emotions in the teaching and learning process. Second, EI theoretical foundations are described, with special emphasis on Mayer and Salovey's model [5]. Next, to highlight the importance of training to develop teachers' emotional skills, different evidence is presented on the meaning of teachers' EI in the 21st century, namely in personal and professional well-being; professional performance; teacher-student relationship; and student academic achievement. In addition, some scientifically validated intervention programs based on a solid theoretical model of EI are presented.

2. Emotions in the teaching and learning process

Teaching and learning are both immersed in emotions. The classroom represents a very complex social context where teachers and students continually interact with and respond to each other's behaviors. Moreover, teachers and students bring their experiences, expectations, beliefs, and purposes to these interactions [6].

In the past, Platonic thought held that society's essential task was to teach young people to find pleasure in learning activities, just as all learning had to have an emotional basis. Consequently, the OECD has included in the International Student Assessment Programme, the evaluation of students' well-being. In this report, it is problematized whether students are happy, whether students feel part of the school, and how much the quality of interpersonal relationships influences their academic performance [7]. The evidence of such issues is centered on the understanding that students pass most of their time in a school context and that schools should not only be spaces for academic acquisition but mainly conceived as environments conducive to the development of personal, social, and emotional skills, indispensable for students to thrive and be happy.

In addition, neuroscience defends that the essential element for learning is emotion, as without emotion there is no curiosity, no attention, no learning, and no memory [8]. So, in the field of emotions, it is possible to state that is the basis of learning [9]. Emotions have a strong effect on learning: positive emotions can arouse

students' engagement and promote the acquisition of academic skills, while negative emotions can distract students from learning [8]. Thus, it is important to clarify that emotions can facilitate or hinder learning, and this which depends on the emotional environment or context that the teacher provides. In this context, it should be noted that the teachers' emotions have significant consequences on the students' emotions.

Teaching is a very demanding activity and requires hard emotional work. Since teachers frequently have to manage many emotional situations simultaneously in the classroom. The teacher provides students with emotional support, promotes a stimulating classroom environment, and manages disruptive behavior effectively during the teaching and learning process [10, 11]. Consequently, emotional challenges often origins their stress, frustration, emotional exhaustion, and turnover intention [12]. Therefore, the ability to use emotional processes adaptively or to be emotionally intelligent is a fundamental skill for all teachers [13, 14], as educational work also includes knowing how to be empathetic, and emotionally support students, whether in the classroom work, as well in students' problems. That way, teachers also have to know how to express and manage emotions correctly during classes, as well knowing how to recognize and identify students' emotions.

Given the centrality of emotions to the teaching and learning process, to be able to develop effective teaching practice, emotionally educate students, and remain emotionally healthy, teachers need to learn to be emotionally intelligent. Therefore, experiencing positive emotions may prompt teachers to build positive emotional connections with students, parents, and/or teaching staff members, leading to positive thinking and problem solving [15], which allows the teachers to effectively deal with some of the most typical classroom conflicts [14].

Considering the role of emotions in the teaching and learning process, the study of teachers' emotions increased notably in the 1990s, which led researchers to pay more attention to the relevance of EI in teaching work. Thus, the integration of emotional skills with the cognitive component is evident, according to the great importance to feelings and emotions in the education context.

3. Theoretical foundations of emotional intelligence

Salovey and Mayer [16], based on studies related to emotions, which show that they have adaptive functions, refer that the intelligence quotient does not encompass the competencies that contribute to intelligent and adaptive behavior, and that there are individual differences in the way individuals deal with emotions and organize emotional information. Thus, the concept of EI was elaborated by the authors from the literature on cognition and emotion, in social interaction processes, through a solid theoretical basis. That way, the EI concept is introduced in the academic world through Salovey and Mayer, pioneers in the EI study, and the first to propose a theoretical EI model, initially defined as "an ability to monitor one's own as well as other people's individual feelings and emotions, discriminate between them and use them in ways that guide thought and actions" ([16], p. 189).

When presenting the theoretical EI model that qualifies intelligence as emotional, Salovey and Mayer [16] argued that it would be important, for a broader understanding of human intelligence, to consider an area of expertise linked to emotional processing, referring to the mechanisms of perception the information contained in emotions, the regulation of their influence on mental activity and the storage and use of knowledge about this information.

Afterward, Mayer and Salovey [5] reformulated the EI model and defined EI as "the ability to perceive accurately, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth" ([5], p. 10). Each skill has a hierarchical organization, according to the complexity of the processes involved, thus, higher-level skills are related to awareness and management of emotions, and lower-level skills correspond to knowing how to perceive and express emotions.

It should be noted that there are numerous definitions of EI, this way different theoretical models were developed [5, 17–21]. However, despite different EI concepts, the different theoretical models have several common points [22]: all models tend to conceptualize EI in components, which can be understood as dispositional traits or as learning-dependent skills; many of these components are repeated in all the models, although they are understood as emotional processing phases (e.g., awareness and understanding of emotions, expression, and emotional regulation); and all models distinguish between an intrapersonal component and an interpersonal component, one that affects how we experience emotions in ourselves, how they impact us and what we do with them, and another that affects how we experience the emotions of others.

Despite the existence of various EI models, it is worth noting that Mayer and Salovey's EI model continues to be the most widely used and accepted definition [23] since it is considered the model that presents greater scientific rigor [24].

It is important to note that Mayer and Salovey's model understands EI as a competence that can be learned and developed, and that consists of the adaptive use of emotional information [22]. The ultimate goal of this adaptive use of emotional information is to solve personal and interpersonal problems, allowing optimal adaptation to the environment [25].

4. Teacher's emotional intelligence in the 21st century

In three decades of EI's scientific existence, this has been seen as an important component of teaching activity, and several studies show that EI is one of the personality traits that affect the teachers' pedagogical practice [26, 27].

The emotional reality of teachers confirms that they exercise their work in a society full of imbalances from different origins and in schools that, during successive reforms, are slow to find an orientation that meets social needs, with high levels of stress involved in the educational process [28]. Thus, the work demands increase in recent decades forces teachers to emotionally adjust to the different roles that involve greater participation and decision-making inherent to pedagogical practice.

All social changes place teachers in situations that surpass them and for which they were not prepared throughout their academic training. The demands placed on schools today are not only formative issues but also emotional, personal, and social issues. Thus, it is evident that the needs of society in the 21st century are different from those of the last century. In this context, teachers develop their work activity surrounded by imbalances of different natures, which require great emotional skills in the development of their teaching practice [29]. The COVID-19 pandemic was added to this reality, which contributed more to the emotional wear and tear of everyone involved in the teaching process. Moreover, in the school context, teachers are the main emotional leaders of students, and their ability to perceive, understand and

regulate students' emotions and their own is the best index of the class's emotional balance [30]. That way, EI abilities complement the teachers' skills, and a growing studies number indicate that teachers' EI is particularly important in personal and professional well-being [26], in professional performance [31], in the teacher-student relationship [32], and to the student academic achievement [33].

Regarding personal and professional well-being it is important to understand that teaching requires the strategies applied for the perception, understanding, and management of emotions and that insubordination, confrontation with students, problems with the school, and loss of authority led teachers to the limit of their resistance. So, teachers' stress is "the experience by a teacher of unpleasant, negative emotions, such as anger, tension, frustration, or depression, resulting from some aspect of work as a teacher" ([34], p. 28). It should be noted that teacher stress, due to the influence it has, can lead to burnout or/and complete abandonment of teaching [35, 36].

Previous studies have examined a wide range of potential variables that impacted teacher stress, including the school environment, classroom, instructional factors [36], the loss of credibility in teachers' work, and the low social and professional status, among others, diminish teachers' ability to react in the face of such instability [37]. That way, being a teacher in the 21st century implies exercising a work that, according to social demands, proves to be an activity of constant wear and tear, with harmful consequences for physical and mental health. This constant wear gives rise to negative emotions, with four being the chronic emotions (anxiety, frustration, guilt, and anger) most felt by teachers [2]. These constantly lead to stress, depression, and burnout that result in personal and professional unease.

Studies show that before the COVID-19 pandemic, teaching was a stressful job, with close to 8% of United States teachers leaving teaching [38, 39], and with 40–50% leaving teaching during the first 5 years [36]. Also, data from the Teachers in Europe: Careers, Development and Well-being report show that stress is common among European teachers [40]. This report included teachers from all 27 European Union Member States, and teachers from the United Kingdom, Albania, Bosnia and Herzegovina, Switzerland, Iceland, Liechtenstein, Montenegro, North Macedonia, Norway, Serbia, and Turkey. It should be noted that the sample was collected before the COVID-19 pandemic, during 2018–2020. The OECD ([41], p. 102) underlines those European teachers experiencing high levels of stress at work are more likely to report their intention to leave teaching and move to other careers in the five years that follow. Also, a systematic review, about burnout in Portuguese teachers, revealed the scarcity of studies in this country. Nevertheless, the results suggest that the incidence of burnout in Portuguese teachers is significant [42].

Furthermore, personal characteristics, like lack of EI are considered teachers' stress and burnout antecedents [35], and scientifically validated training programs prove that training teachers' EI skills are an effective technique to improve individual resistance to stress, as well as to combat burnout [13].

Therefore, EI constitutes a key variable to understand and improve the competence of teachers by favoring their adjustment and reducing the level of burnout they experience [43]. Different studies also show that teachers' EI is one of the personal resources related to personal and professional well-being: stress and burnout [35, 44], to work engagement [26, 33, 45], to general well-being [45] to teaching satisfaction [46], happiness and job satisfaction [27].

Regarding professional performance, studies elaborated in various countries show that EI plays a significant role in teaching [47], is positively correlated with teacher's efficacy [33, 48, 49], with teacher performance [31], and the efficacy for classroom

management [11, 50], and also the need to prepare for the management of unpredictable and difficult-to-manage situations (e.g., conflict) in the classroom context [29]. Other studies found that teachers who tend to have higher levels of EI employ the most appropriate conflict management strategies for classroom managing conflict [29, 51]. Therefore, teachers with more EI develop more resilient strategies to deal with setbacks and adversities that may arise in the educational context [4]. Besides, the results of 1281 Chinese school teachers also show that teachers' EI has a significant impact on professional performance [46].

Moreover, the comparative study between the teachers' EI of the United Kingdom and India demonstrates that an increase of EI levels leads to work productivity and effectiveness [32]. Also, a study with teachers from Spain shows that teachers with higher EI scores show greater coping resilience and higher work engagement levels [4]. Similarly, Wu and collaborators' [49] study, with Chinese middle school teachers, demonstrated that teachers' emotionally intelligent have a greater motivation to teach and fewer intentions to quit the profession. Additionally, the relationship between teacher EI and work commitment has also been studied, with IE having a positive effect on teachers' energy, focus, and persistence [26, 52].

As previously seen, teaching is an emotional activity, involving the teaching work a significant emotional charge to facilitate and optimize the quality of interpersonal relationships in pedagogical practice. According to Extremera and Fernández-Berrocal [37] teachers' EI has a medium and long-term impact on curricular achievements and student outcomes. Thus, regarding teacher-student relationships, EI make positive effects on interpersonal relationships [29], and studies show that teachers' EI influences good relationship with students [32], provide a steady and wholesome classroom environment [3], and is related to the promotion of an appropriate classroom emotional climate, which provides increased motivation to learn, and increased academic performance [50]. Likewise, Maamari and Majdalani [53] study show the importance of having teachers emotionally intelligent to increase students' EI and, also their satisfaction.

Moreover, teachers' positive emotions improved the relationship with their students [10] and provided the conception of a classroom climate that enhances cooperation, facilitating the increase of positive emotions and the creation of a classroom climate favorable to learning. Therefore, teachers' emotional skills in the pedagogical relationship generate emotions and behavior in students. Teachers increasingly respond to emotional experiences in the pedagogical practice, experiences that have serious consequences for the learning process. Consequently, teachers' EI skills also contribute to students' school achievement [10, 33]. Besides, teachers recognized the importance of EI and how it becomes a crucial constituent of the teaching-learning process [54].

That way, teachers' EI skills are what lead to positive educational measures in 21st century classrooms, and for teachers is the kind of skills that has the potential to generate actions that can change lives.

5. Emotional intelligence skills training: intervention programs for teachers

There are programs to reinvigorate and exercise teachers' EI skills, largely ignored in pre-service teacher training, about their practical application. Despite different studies demonstrating the meaning of emotional abilities in teaching [27, 29, 33, 50].

However, despite all this evidence, most teachers do not receive tools in academic training to deal with emotional situations. As previously mentioned, to develop new and necessary skills in students, for the 21st century, a socio-emotional education is defended, for the construction of sustainable humanity [55]. Though to develop these skills, it is essential to have emotionally intelligent teachers, aware of themselves, their abilities, and emotional needs, capable of genuinely promoting and enhancing a safe, caring, and well-managed teaching and learning environment, managing to increase and stimulate the development of these same skills in the students and, mainly, constitute the model for these skills.

Therefore, the inclusion of EI training programs for teachers should be part of their "pedagogical baggage", for which it is necessary to constitute a relevant field of emotional knowledge in their training [29]. Teachers are aware of the need to work on emotional education in the classroom. However, they have neither training nor resources to develop it [56, 57]. In addition, several studies found that emotional abilities can be worked on and developed throughout life [58, 59]. So, EI skills must be learned by teachers, as classes are the emotional learning model with the greatest impact on students, and adequate levels of EI help to face more successfully the setbacks of everyday teachers working life that they are exposed to daily at school context.

To promote teachers' work productivity, Moghanlou and collaborators [60] recommend training EI to improve skills in the workplace and everyday life. Thus, training teachers in their emotional dimension is relevant, through validated training to develop emotional abilities. According to Hernández-Amorós and Urrea-Solano [56] study, teachers also indicate the need for training in EI skills, especially in their initial training and throughout their professional activity.

It is important to emphasize that studies shows that it is possible to improve emotional abilities (identification, understanding, use, expression, and regulation of emotions), with these improvements prevailing over time [58, 61]. This way, through the application of a scientifically validated training program in emotional abilities, the different benefits observed in the trainees were recorded (e.g., increased happiness and satisfaction with life, decreased stress, physical problems, and cortisol rate, increase in their employability and increase the quality of family relationships), compared to individuals in the control group [58, 61]. What is relevant is that these changes prevailed after the training had ended, with its beneficial effects remaining after six months [58] and one year after training [61]. These programs confirm the relevance of the application of Mayer and Salovey's [5] EI model in teacher training, demonstrating that it is possible to develop emotional skills in adulthood and that the learning made during training remains in the trainees' lives.

Considering the studies about the meaning of teachers' EI, several intervention programs for teachers were developed. Hen and Sharabi-Nov [3] through a study with 186 teachers, developed and studied a model, throughout a training course, to address the growing needs of teachers, to practice and implement emotionally intelligent learning environments. The results indicated an increase in teachers' EI and empathy. Both expression and regulation of emotions predicted the development of empathy at the end of the course. The teachers' reflective attributions indicated an increase in emotional awareness, emotional regulation, and understanding of the other.

The intervention program to promote teachers EI, developed by Vesely and collaborators [62] aimed to the reduction of teaching stress through the development of emotional abilities. The program includes modules of emotional self-awareness, expression, understanding, and management of one's own and others' emotions.

The results of this program shows that teachers improve their levels of EI after the intervention. Likewise, improvements have also been found in their levels of resilience and teaching effectiveness. The results even indicated lower levels of stress and greater life satisfaction after one month of the intervention.

Also, Corcoran and Tormey [63] intervention program focused on teachers' EI development through a series of activities that followed the EI approach applied to the workplace, based on the four basic emotional abilities: perception, assimilation, understanding, and regulation. The results show an increase in teachers' emotional regulation. In addition, teachers reported that, after the intervention, they realized the impact of their emotions and the emotional management of their students. Teachers also indicated that, since completing the EI training, they were more aware of their body language in the classroom, and how it influenced their students and used it to their advantage. They also concluded that they dealt more with an empathic approach to managing their students' problem behaviors after the EI intervention program. It should be noted that many teachers reported that the EI training helped them to improve their emotional management in the classroom. In this way, they modified the teaching method or changed the focus of attention depending on the students' emotions perceived by the teacher.

Another way to develop emotional skills in teachers is RULER (Recognizing, Understanding, Labeling, Expressing, Regulating), a systemic evidence-based approach to social and emotional learning. RULER is much about developing a growth mindset about emotions (e.g., emotions matter for learning and decision making) as it is a set of organized skills that can be learned [64]. These skills, based on Mayer and Salovey's [5] EI model: Recognize one's own and others' emotions; Understand the causes and consequences of emotions; Label emotions with varied and precise vocabulary; Express emotions constructively and correctly in different contexts; and Regulate one's own and others' emotions. The development of these five RULER skills relies on four core tools: Charter (builds and sustains positive emotional climates by creating agreed norms about how people want to feel and how they can help each other experience those feelings); Mood Meter (improves self-awareness and social awareness and supports the development of a nuanced vocabulary of emotions and a range of strategies for regulating emotion); Meta-Moment (provides a process for responding to emotional situations with strategies that align with one's best self and support healthy relationships and personal well-being); and Blueprint (supports the development of empathy and conflict resolution skills, serving as a guide for reflecting on conflict and restoring affected communities).

RULER also includes an array of practices and routines designed to enhance children's and adults' lives and positively influence classroom and school climate. For these reasons, RULER is characterized as an approach (i.e., a set of guidelines, principles, and practices to guide social and emotional learning implementation and behavior) rather than just a program (i.e., planned activities) although sequenced and structured programing is one key component [64]. So, RULER is more inclusive as it is focused on the development of EI skills in the school community (school leaders, teachers, staff, students, and families) and it is considered one of the most prestigious and effective programs [65].

RULER training in teachers shows that teachers report higher vigor, dedication, absorption in their work engagement, less burnout, and they also had higher EI scores after training [66]. It should be noted that results of more than 60 educational centers, where RULER was applied, showed that there are higher levels of cordiality, affection, and social connectivity between students and teachers, as well as higher

levels of autonomy and leadership among students. In addition, after the training, teachers also focused more on the interests and motivations of their students [67].

6. Conclusions

The 21st century society is changing at a dizzying pace, and teachers' are facing increasing demands to prepare students for rapid economic, environmental, and social changes. Also, for jobs that have not yet been created, for technologies that have not yet been invented, and to solve social problems that have not yet been anticipated. This task represents a greater challenge in developing countries, where access to information and communication technologies is a privilege, and where inequalities have increased during the two last years. Moreover, the COVID-19 pandemic affected all those involved in the education process. Thus, if it was already necessary before 2020 to include emotional education in teacher training programs to develop emotional skills, it is now imperative that such training occurs. Therefore, the teaching system in higher education must be also oriented towards the integral development of pre-service teachers, in their emotional and behavioral aspects, to improve their professional performance in the classroom.

Knowing how to read the emotional information and think intelligently about them helps teachers to adapt properly to the events that live daily at school, both with students and with other teachers. Therefore, in recent years, studies have been developed that provide multiple evidence of how EI abilities influence teachers' personal and professional well-being. As seen, the results show that emotionally intelligent teachers have better levels of emotional well-being, professional performance, teacher-student relationships, and better student academic achievement. Thus, teachers need to have EI abilities developed, as these have an important role in the teaching process and in their own well-being. For that, different authors defend several reasons for implementing teachers' emotional education programs [26, 27, 29, 33], stating that emotional skills are essential to human progress. However, despite all this evidence, most teachers do not receive tools in academic training to deal with emotional situations, because in their professional training the academic aspect is prioritized instead of the human aspect. So, it is significant to emphasize the teachers' EI consequence in the teaching role.

For these reasons, throughout the chapter, evidence has been pointed out that allows us to observe the need to develop the teachers' EI as essential to their work. It is, therefore, necessary to have these skills as a complement to intellectual development, both being fundamental elements for the integral development of teachers. The development of emotional abilities enables teachers to better manage the challenges they face daily in their professional activities. In addition, they also increase well-being (e.g., with lower levels of stress and burnout). The importance of developing teachers' EI has been proven with the application of training programs. Therefore, teachers' training in emotional skills is central to the success of their pedagogical practice. Yet, although teachers' emotion is the pillar on which pedagogical practice is built, teachers' academic training has not adopted the emotional education construct as a central part of its assignment in most countries. Moreover, society is increasingly aware of the need for a specific curriculum in the field of emotional skills, mainly in the education area. In this sense, a new model of pre-service teacher education is needed that includes emotional education, as necessary training for future teachers'.

This review concludes with the need for restructuring pre-service teachers' programs since teachers' EI abilities must be considered and included in a compulsory subject of emotional education in the pre-service teachers training. Furthermore, also schools should provide EI training to teachers who face emotional difficulties. Therefore, teacher training policies should give priority to the inclusion of emotional education in the pre-service teacher training, for developing EI skills due to the significance they present in the teaching 21st century.

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Author details

Sabina N. Valente[1,2,3*], Abílio A. Lourenço[4,5] and Sergio Dominguez-Lara[6]

1 Research Center in Education and Psychology, University of Évora, Évora, Portugal

2 VALORIZA – Research Center for Endogenous Resource Valorization, Polytechnic Institute of Portalegre, Portalegre, Portugal

3 Centro de Investigación en Psicopedagogía e Investigaciones Psicopedagógicas, Buenos Aires, Argentina
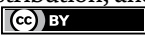
4 University of Minho, Braga, Portugal

5 Center for Research in Psychology and Education, Alexandre Herculano School Group, Porto, Portugal

6 Instituto de Investigación de Psicología, Universidad de San Martín de Porres, Lima, Peru

*Address all correspondence to: sabinav@uevora.pt

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Chapter 6

A Cultural Approach in the Synchronous Class in English Teaching and Learning

Ned Vito Quevedo Arnaiz, Nemis García Arias
and Fredy Pablo Cañizares Galarza

Abstract

If culture is defined as a way of training to obtain knowledge through educational channels, the concept is associated with educability. Therefore, teaching cognitive, attitudinal, and procedural knowledge directly indicates teaching and learning culture to acquire norms and patterns of sociocultural behavior. The purpose of this study was: to debate about the way interaction among students and teachers in synchronous classes based on life's materials, topics, and methods, and critical or reflective thinking can be adapted by the teacher to the students' closest environment to communicate in English as an international language. If a language is taught, spoken, and learned in the country, culture surrounding the context is taught. If this language is not spoken in the place, the knowledge system also transmits norms and values, different from those of the language. So, the students get, culturally and socially, modes of action, principles, and knowledge through international language learning. Thus, teaching and learning English as an international language means the way possible interaction has opportunities for every student's growth and the way their personality formation gets integral results. English taught and learned as an international language denotes reaching the students' world and needs to communicate in English as a meaningful international language.

Keywords: culture, teaching and learning English, English as an international language, interaction, cultural approach

1. Introduction

Teaching any subject through an international language implies teaching on cultural issues about the world's life. This is related to the way we, as teachers, deal with teaching, language, and culture and how we must favor in our teaching of English the increase of knowledge and cultural items. But during the pandemic, the teaching and learning contexts have changed and so the approach to this subject.

The purpose of this study is just to debate about the way interaction among students and teachers in synchronous classes based on Life's materials, topics, methods, and critical or reflective thinking can be adapted by the teacher to the students' closest environment to communicate in English as an international language (EIL).

2. What culture means for teaching and learning a language

First, we must define what culture means to us. Of course, the meaning of this word as a verb is to maintain (tissue cells, bacteria, etc.) in conditions suitable for growth. For example, "several investigators have attempted to culture biliary cells"; but, as a noun, there are two acceptations that can be found in the dictionaries:

1. the arts and other manifestations of human intellectual achievement regarded collectively, e.g., "twentieth-century popular culture" and 2. the customs, arts, social institutions, and achievements of a particular nation, people, or other social group, e.g., "Caribbean culture, Ecuadorian culture."

The word culture is a polysemy term, which means that it is understood from different angles. But, although there are multiple possibilities for its understanding, a single interpretation or concept is not defined. We have to analyze all necessary shapes to have a general view.

Culture as synonymous of "everything created by man," as Sergio Valdés Bernal proposed, implies human civilization, the general magnitude in which rational beings have lived and live. As such, it includes all kinds of knowledge achieved by humanity and the ways in which that relationship established by men themselves in society creates wealth and establishes a form of global coexistence.

When culture refers to the intellectual and artistic product resulting from the interpretive appropriation of art, and which, therefore, is assumed as a personal category, the word meaning is incorporated into esthetic patterns achieved, and it reinforces the way in which it becomes people's own meaning and the cultural phenomenon in which each person is immersed to be assimilated, but which could be recreated from their point of view, and developed through the encounter and social reflection of an era. In this case, culture means appreciation, traditions, and customs.

In the event that culture defines a way of training to obtain general and specific knowledge through educational channels, the concept is associated with educability as a result of development and growth organized by society in terms of universal and professional literacy, transmission of everything, types of content, and standards of behavior and training to understand social life; culture is the intellectual level reached by each individual before society or their level of education.

That meaning indicates developing knowledge through formal or informal instruction and is the one that aims to achieve educational levels in the school, as an institution that prepares and responds to the needs of the economic development of each country, and that some include as innate capacities by belonging to a social group, and others analyze it as assumptions and basic values that regulate the behavior and interpretation of this in the social framework, but in both cases, the cultural level is achieved with education.

Therefore, teaching cognitive, attitudinal, and procedural knowledge directly, at school, indicates teaching and learning culture. Teaching a language such as English implies referring to norms and patterns of the sociocultural behavior of one or several Anglophone countries, since transmission occurs through communication. If a language is taught, spoken, and learned in the country, the culture that surrounds the given context is taught. If this teaching-learning process is using a language that is not spoken in the place where it is learned, the knowledge system also transmits norms and values that, from that cultural point of view, differ from those of the language.

Traditionally, it is argued that the teaching of English teaches the norms and customs of English-speaking countries. Thus, the learning of the language is enclosed within the cultural canons of certain regions and countries, however, the learner is

not always going to uproot himself from his own culture, and sometimes, he does not incorporate foreign cultural elements into his life.

Another, more recent position places the learning of a language such as English within a much more general cultural reference framework, as it is a universal language with worldwide influence in any context.

A language is learned but, at the same time, culture is acquired or at least the frame of reference is broadened. In this way, the idea of unity between culture and education when a language is taught has been an inalienable point in linguistic analyzes [1–3], although it is only taken as background in the studies on English as a foreign language, which place more emphasis on the purely linguistic aspect in which one of its components is precisely sociolinguistic [4].

In more recent years, the concept of culture has connoted the presence of the identity of social groups stratified by categories such as intellectual level, beliefs, behavior, among others, much more than the representation of a culture tied to a country and limited in teaching just to the customs and traditions of that place, as the assumption of correct patterns sketching of cultural input that does serve to what the learner expresses.

The teaching and learning of English must correspond to cultural and social norms and standards of accuracy for those countries that speak that language; but as for every person who develops bilingualism, there is a bicultural mind that represents facts of reality according to their own patterns and norms of identity, the cultural fact is present in the acquisition of a second language and constitutes a form of reaffirmation of one's own identity of the subject [5, 6]. For this reason, some authors emphasize that the cultural context for language teaching, as the basis for international communication, must encompass much more than the borders established by a nationality.

One of the most important scholars on the subject is Sandra McKay of San Francisco State University. Her point of view begins precisely by distancing herself from the traditional way of thinking about the relationship between culture, teaching, and the study of a language that has an international impact: "the teaching and learning of an international language must be based on an entirely different set of assumptions than the teaching and learning of any other second or foreign language."

The foundation, that for language teaching culture is an intrinsic element in the learning process, is still present because the relationship is obvious; but the view that English is a means of international communication transforms the achievement of that culture it transmits. In today's world, various types of English are spoken, including English that incorporates a region or country whose speakers communicate with another language. Hence, it is important to observe the way culture can be transmitted with the teaching of a language, which, in turn, allows us to understand the cultural processes related to teaching or learning under pedagogical rules.

3. The formative synchronous lesson for the cultural output

With the appearance of the COVID-19 pandemic, training in universities has become much more specific since it has considered the conditions of each student and has provided different solutions so that distancing does not stop education. This training during the pandemic has been characterized by promoting comprehensive learning in the student's training [7]; in the synchronous and asynchronous lessons, the learners can incorporate their own important strategies and resources, such as time available for learning, and their will to do so.

The integral formation of the student, who is prepared for his professional life, starts from the socialization process that, through communication, expresses skills, moral values, ethical principles, critical and reflective thinking, and a much more adequate behavior in relation to the culture of his profession and the society in which he lives.

Education at the university and for society has as its main objective the integral formation that is expressed not only in knowledge acquired, but also in the modes of action in accordance with those principles established culturally and socially. This comprehensive training, therefore, assumes the humanist conception in which education means full life, the development of skills and abilities [8] for the current moment and for the future, full of transformations in which international communication will have to be more effective, and each global action has an impact on individuals regardless of location. Thus, education will respond to the demands of science and technology, society, and culture in general.

Consequently, the COVID-19 pandemic makes humanistic training focus on the teacher's attention to the cultural elements of knowledge and the improvement of human sensitivity and social concerns based on real differences of all kinds. For this reason, the synchronous class begins not with the moment in which technology allows closeness of those present in different places, but in which the will and feelings of walking together create culture and also educate for life and for communication between social beings with rational understanding.

In the synchronous class, student communication, with verbal and nonverbal responses, is essential to establish a functional virtual classroom; hence, the dependence on technological tools is a fact. Face-to-face conditions are replaced by technological innovations, with which the student's teaching-learning process can be guided and controlled in an equivalent way.

The constant use of platforms and videoconferences reveals the objectives fulfillment and the competence that is formed from remote conditions. Obviously, the development of the intellect and the individual student and the teacher's cultures to manage efficiently the use of technology guarantee success of the training-educational work, or not. This implies that the students, based on the support from the teacher and peers, assume that they can know beyond what they intended to know [9].

The school in the pandemic has remained a social agent of change, but with its human content, it is also a social agent of hope to end the crisis with better conditions for human understanding, which is valid for developing the current culture in front of the crisis and, with it, international communication and the search for solutions to adversity with more noble and human sentiments. And this change in order to win life and all its implications inexorably contribute to understanding culture as part of the application of a much more accurate training and human education to assume the use of technology for the sake of humanity.

The pandemic has activated mechanisms in society for the educational orientation toward the preservation of life and the glorification of the created culture. For this reason, even in the current conditions, it is based on what cultural issues can be attended by educators in order to continue perfecting the process: the durability of formal education, the context in which education occurs, and the language or resources with which the transmission of knowledge materializes.

The student expands his learning and his theoretical and practical vision for the problems in life with his training, which at the end is achieved with reflective thinking, culture, and communication. The interaction is, therefore, the way that allows

the organization of the classes with synchronous and asynchronous meetings between the teacher and the learner to achieve the horizontality of the process [10] and together achieve the social aspiration of generating culture with strong knowledge.

The view on synchronous and asynchronous classes has increased in recent years, especially to explain the necessary use of technologies [11–17], whose realization is achieved through Information and Communication Technologies (ICT) and the time conceived for the link, but following established didactic principles. The participants in the synchronous classroom are linked from different places coinciding in time, hence its definition "at the same time." The student, to achieve his learning, has an asynchronous interaction, in which time is "distributed" or "dilated" throughout the entire teaching organization [18], and the participants establish their own learning strategies with their autonomy to meet their goals.

Significant and experiential learning in synchronous classes focuses on achieving the student's objectives from the appreciation and usefulness of that experience, since the cultural and didactic purposes that each educational action facilitates are maintained. In other words, the subject is capable of putting into practice their cognitive, procedural, and attitudinal knowledge, based on their cultural context and perception of reality [19].

With a cultural approach, as a historical condition of knowledge, the transmission of knowledge occurs under the predominance of the synchronous experience in a communicative way and the strategic scaffolding of the individual for his asynchronous experience with which he develops his own knowledge.

The synchronous class includes the interaction between the teacher and the student in a virtual classroom [20], and it is valued as the natural continuity of face-to-face classes, in which the main characteristics that can be evaluated are appraised. It must be fulfilled in formal education. The asynchronous class is judged as it subordinates to the initial synchronous class and, as derived from the independent study, needs that every university student works. Although both are extremely important and currently they complement each other, the synchronous class continues to have a greater impact on the teacher-student relationship; hence, it is a priority to focus the attention in language classes as a transmission of cultural knowledge.

In the conditions of the synchronous class, not only the shared time is important, but also the context where the educational processes are taking place, especially since each place presents a wide variety of cultural development. Each student frames a different context that the teacher must attend to, and the teacher, as well, must analyze and understand their own context.

The synchronous context is not the sum of different places and technologies; it is to look for a possible environment where common needs, objectives, challenges, and aspirations converge from a real distance, but under a prism of consensual interaction and respect. The learning scenario is ecologically changing and widening the gaps, as César Coll [21] would say, "... not only the learning of the functional use for these technologies, but also the knowledge of the sociocultural practices associated with the management of these technologies (…) to participate in those practices using the mentioned technologies appropriately" (p.125). Of course, in a state-of-the-art technological development career, in most cases, is ahead of the economic possibilities of the students.

The place of the virtual synchronous class is quintessentially transformative of itself and of its asynchronous counterpart. It is based on connectivity through networks that, in order to fulfill their pedagogical role, must organize all interaction in

a place where present, past, and future converge; reality and virtuality; physical and formal environment and media and informal environment; and also education and learning online knowledge and the direct emotion of feelings and affections.

The virtual language of a synchronous class is achieved through simultaneous ICTs between students and teachers because learning always indicates cultivating oneself with cultural tools contextualized to reality [22]. But such language under the context of the pandemic creatively occupies all possible forms, combining oral language, written language, kinesthetic and gestural language with logic mathematics, and the algorithms of computerized systems. For this reason, the new experience of synchronous learning relates technologies to man's needs to communicate, needs that network his education and shape his training for his working life, among other concepts and possibilities that can only occur within virtual development.

Of course, there is no single path, nor can an educational process be uniform, which is becoming more flexible and more diverse, both in its methodologies and in its strategies for assuming them. The construction of knowledge of university students starts from their own realities, from the involvement they have in solving their problems and from the responsibility they feel to fulfill their social obligations. The teacher must be able to offer various resources and take advantage of virtual group work to achieve the objectives of the subjects.

A cultural approach in the synchronous classroom requires the teacher to be both, a flexible and a strict conductor, a friend and a facilitator of the student's learning process. That dominates the content and the virtual learning environment, which promotes its appropriate and diverse use of meaningful language in communication. The teacher who prepares long for comprehensive training also creates and molds convictions and makes synchrony facilitate the empowerment of cultural baggage. A participant under the cultural approach of technological virtuality must be sensitive to appreciate the world and understand the social and natural realities of any part for his realization as a human being who is a biological, social being, and a transformer of those conditions in the development of the personality.

4. Teaching English and National Geographic Learning

So, when we teach language, we also teach culture. Therefore, the course selected for teaching is of paramount importance to increase the students' knowledge and their possibilities to understand the world. Then, we have to say that our teachers are using a very attractive course to teach English at our university, which contributes to have an extensive cultural background, in order to succeed in life and please demands of knowledge from that coming context students are going to live.

Lots of series from Cambridge University, Pearson, Macmillan, National Geographic Learning, among others, and their e-learning platforms have considered culture to teach and learn English; moreover, the focus of attention in each is quite different although their goals are directed to get an international standard from the official accreditation levels of the Common European Framework of Reference for Languages (CEFR).

In the course by National Geographic, Life, the approach to English is toward an international language where the language has been developed following links to wider notions of cultures than that of the country where the language is spoken. In this course, the skills to develop learning are a vehicle to an important incentive for students to know more about the world cultures, and two new issues are incorporated

to the methodological analysis in each unit: real life functions and critical thinking, besides the common study of grammar, vocabulary, pronunciation, listening, reading, speaking, and writing.

National Geographic has established high standards in terms of interaction with different contexts and cultures around the world. It has been clearly defined the classification of sociocultural strategies [23] that students should learn how to use, which incorporates two inner strategies: one for establishing and maintaining intercultural contact to avoid intercultural problems, whose purpose tolerates to do the students' interaction with several possible cultures and through different cultures, and the other for creating sociocultural portraits of an L2 context and the participants in intercultural communication, which allows keeping and increasing self-cultural identity for every person; in other words, it is about finding potential ways to understand the language users and different contexts, no matter their cultures, at the moment of communication, in which backgrounds that are similar to one's own culture are distinguished from those in which they differ.

For this reason, National Geographic, which has been meticulous all the time in the way in which nature and society are echoed, is committed to reflecting the culture of the world in which we live, a general culture for the whole humanity, in which the most significant achievements are seen and treated within the course as if there were no distinctions of any kind. Teaching culture through language for the authors of Life means:

- To accept a culture theory about the world, people included in it, and the ways communication reflects them.

- To include knowledge, gestures, beliefs, art, morals, laws, costumes, and any other capabilities and habits acquired by man as a member of society in the way people think and act.

- To have the sense of the equality among cultures and an increased understanding of one's native and target cultures.

In addition, many definitions have been written about English as an International Language (EIL) and the way people actually analyze it, alternating a view of EIL as a mix of the many varieties of spoken English today with another in which English includes second language speakers. However, the global use of English for communication is growing fast among speakers of other languages in places where English is not the main or second language and therefore the importance of EIL studies for teaching and theory [24–30]. Data collected and referred to constantly evidence English expansion and its impact in communication:

1. More than 350 million people around the world speak English as a first language.

2. More than 430 million speak English as a second language.

3. English is the international language of business, which includes travel and trade, and in jobs for multinational companies, it is required.

4. Much of the technical terminology in science and means of communication is based on English words, so the language is used for their discoveries.

5. English will provide the opportunity to study with the best educational programs.

6. English is the language most exercised on the Internet every day, as 52% or so of the world's most visited websites have been surfed among the 565 million of daily visitors on the Internet.

7. This language opens the doors of entertainment and publishing in scientific journals, so the language users reach a vast enlightening world of music, movies, books, and awards that also increase culture [31].

That is why, this top language and general culture are very close to each other, because people communicate what they are and people are just the result of biological and social evolution in fact; in other words, people evolve constantly as they are the result of global understanding through language and culture.

Good English skills mean that learners are not reliant on translators and can work faster and more accurately with many English information and cultural sources. Teaching culture started under a theoretical foundation on foreign language education, which historical achievements were mentioned by Yang and Chen [32], but there has been a shift afterward as Culture is revealed at different layers of depth [33]:

- The publication of Nelson Brooks' Language and Language Learning: Theory and Practice, in 1960. This book started a discussion on the topic of teaching culture in the foreign language classroom.

- At the turn of the twentieth century, the Standards for Foreign Language Learning in the twenty-first century (National Standards in Foreign Language Education Project, 1996) enumerated culture as one of the five objectives for learning a foreign language.

- In November 2001, a Common European Framework of Reference for Languages appeared. After that study, the European Union Council Resolution recommended using the six reference levels: A1, A2, B1, B2, C1, and C2, to control and support the ability of using the language. The CEFR ideas have been widely accepted as the standards for grading an individual's language and culture proficiency.

- In 2002, Teaching English as an International Language by Sandra McKay of San Francisco State University states that teachers can find a different approach to teaching and learning culture moving from teaching a foreign language to an international language.

- And we dare say there must be a new landmark coming out soon related to culture as a result of this technological moment we are living right now.

In terms of how people can learn any language, there are different models. One of the most acceptable theories is that of three-circle one proposed by Krachu in [34], which was referred to McKay in 2002 to move the aim of teaching English from the ideal inner circle to others in which English is also valid for learning, through which people are reflecting a cultural representation in the language according to the place of learning and interaction (**Figure 1**).

1- Native speaker

2- Bilingual user

3- International user

Expanding- Circle countries

Outer-Circle countries

Inner-Circle countries
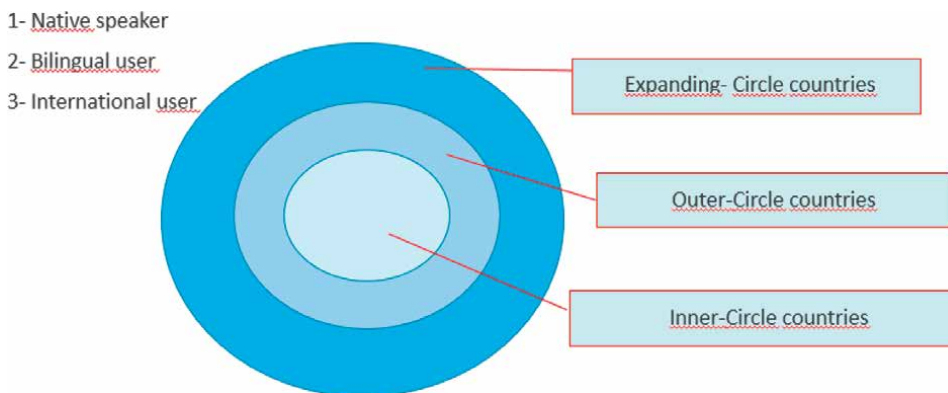
Figure 1.
The three-circle model as shades of usage.

It is correct to use English in any of those circles or levels, in order to differentiate the possibility of using the language in many types of countries with different cultures and languages, but just as usage shades of an international language. English rapidly develops more complex relationships within and between communities of speakers around the world; the dialog addressing its role as a global language needs to be continued to expand the analysis of this language.

The inner circle is composed of those countries where English is developed as the traditional cultural and linguistic bases of English, i.e., the circle represents the core of the language, which share in common their Angle Saxon and some following roots of culture, but for every country, each individual develops a national identity competence, as English is the main language nationwide, so its teaching corresponds to that of a main language.

The outer circle represents a political relation to English through the institutionalized non-native varieties of the language which are in contact with other native or non-native languages that are official languages in those areas where long periods of language and culture exchange under political domination have raised accommodation and acculturation processes among the languages, because they have at least two important languages as official languages that provide a multicultural identity competence. This circle matches the concept of ESL teaching.

The expanding circle includes the countries where the varieties of the language are used essentially in EIL contexts. That means that English is used everywhere for different reasons and it is perceived as part of the different cultures of the world. Nevertheless, the users of English increase their national identity competence as the grasp of that language favors knowledge and the recognition of what group the person belongs to culturally speaking; so in our opinion, the speaker develops a reinforcing self-cultural identity competence to differentiate them for developing his or her own in a wider level. That is why, the circles are just shades that can vary from place to place. The number of people learning English in different regions of the world that keep their roots and values is vast, and then, English is perceived just as a culture growth. Therefore, countries like China are definitely greater in terms of language user than some populations living in the inner circle countries, but they develop their Chinese culture with proud.

As a result of that, we can say there is a new reality to approach the ELT that we as teachers have to know and adapt.

- Language learning must be replaced with one that recognizes that individual classrooms within one culture can vary greatly in terms of the expected role of the teachers and students. That is, there are a lot of new ways to engage in the process of learning a language, and in each, the roles of the teacher and the students have been enlarged. So, there is no a single way to teach and learn English to communicate; therefore, there are lots of possible correct notions of English everywhere.

- In the teaching of an international language, bilingual users should be allowed to take ownership not only of the language but also of the methods used to teach it. Because if people are going to use any language, they must keep on going the way their cultural background and identity must develop to belong to their social group forever. Besides, they must use the language with autonomy and creativity, because every individual is different and uses the language with their own strategies and methods.

- The use of technology in education has increased fast lately, and new ways of interactions have been created. Therefore, interactions are freer than ever, so what people are incorporating to the language as embedded cultural output is more flexible and meaningful to everyone; thus, we have to approach culturally to the world people are living and make learning and teaching more significant for interaction by all means to all users.

These three points are the heart of teaching and learning in our university today. The series Life, which is a course to teach worldwide, can meet the expectations to learn English in which the students learn using their own cognitive and cultural structures, but other teachers can also have the same view to teach the language more significantly to incorporate culture from the whole world into the students' mind. Life shows now the varieties of places, societies, and human results, so the teaching of English should show varieties of cultural issues the world around, incorporating the local reality as a valid tool for teaching.

Unfortunately, the issue of developing the reinforcing self-cultural identity competence has received insufficient attention in the context of teaching English as an international language yet. Traditional teaching methods and the influence of teaching English from an Anglophone context have not allowed other key developments for the indigenous and autochthonous culture of other people who use English as a cultural means of international communication.

In a study carried out by Kirkpatrick [35] on the use of traditional Chinese medicine and its therapeutic properties, beyond what has been described by scientific methods, it was noted that some points of view about what this procedure means now, and what it means traditionally for native people, have been modified for its acceptance in English-speaking countries, which reflects that important cultural elements are resized through the use of English.

In other words, the many versions of English as an international language must foster standards in cultural behavior, in which national identity will play an important role. This double growing in the development of English and the national culture from different countries, according to Anchimbe [36], needs a different user development: "... English as an international language to maintain its currency and vitality, it will have to be spoken by different voices yet understood by different ears. The differences, community-based as they are, are inevitable since, due to the specificity of ecology, no

two communities can be found to use a language in exactly the same way..." (p. 284). This reinforces the need that from its conception must be done to destandardize the use of English and name any learning of English only as an international language and thereby erase the barriers created by the circles already mentioned.

This observation in favor of teaching English, only as an international language, adheres to a global conception of culture and the need to influence learning based on local recognition and the need to strengthen cultural identity patterns. For this reason, in Ecuador, and in any other part of the world, the users of the language can teach and learn different varieties of English, multiple English because the people's cultures are multiple too.

5. Teaching culture in the synchronous lesson

In times of pandemic and seclusion, the students depend much more on their own strategies, to expand communication in English from virtual classes and get their own resources to enrich the English learning autonomy; but this time, when we think about teaching and learning English as an international language, the goal must let students reflect upon their reality and communicate to others about the surrounding context.

According to a cultural approach for teaching an international language, McKay stated that: "... the concept of thinking globally but acting locally is highly relevant to the teaching of EIL. The evidence clearly suggests that the use of EIL will continue to grow, as an international language that belongs not just to native speakers, but to all of its users. Given this shift in ownership, the time has come for decisions regarding teaching goals and approaches to be given to local educators so they can take their rightful place as valid users of English" ([27], p. 129).

It means that in any lesson we teach and learn, we can think globally, that is, we can show what humanity has achieved at this moment showing cultural issues referring to the virtual moment the world is living. But we must have the students act in the classrooms, talking and reflecting about their own experience and problems, and then, we must think about our goals in English in which the final objective must be interaction and communication among students concerning their surroundings and day-to-day life. Finally, teachers must think about the way the students are going to use the language meaningfully as valid users of English under present conditions, so that the need to speak and use the language arises from students' real and authentic necessity to communicate.

6. Conclusion

The analysis of teaching English and universal culture through language has been debated. According to the current situation, teaching and learning English as an international language means the way possible interaction among students and teachers in synchronous classes has many opportunities for the growth of every student around the world and the way the formation of their personality gets integral results.

The fact that English is taught and learned as an international language means that any training must be based on materials, topics, methods, and critical thinking adapted by the teacher to the students' closest environment to communicate in English as a real international language, which must reflect a more thoughtful culture and identity in people's development.

Author details

Ned Vito Quevedo Arnaiz[1]*, Nemis García Arias[1] and Fredy Pablo Cañizares Galarza[2]

1 UNIANDES, Law Faculty, Santo Domingo, Ecuador

2 UNIANDES, Software Faculty, Santo Domingo, Ecuador

*Address all correspondence to: us.nedquevedo@uniandes.edu.ec

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Efficient Conscious Speaking - Live Communication Pedagogical Technique: "Speaker Storytelling Walk 2.0"

José Jesús Vargas Delgado

Abstract

Oratory is the art of speaking eloquently, it is the art of communicating persuasively, and being able to generate influence over an individual or a group, with a series of common specific characteristics. It emerged in classical times and is considered a prose literary genre. Preparing a speech is an intensive learning pedagogical process. A great opportunity that allows us to order with a challenge, and systematizes our ideas with concentration, express them from our presence, which invites us to document ourselves and makes us protagonists. The speaker's walk is a very little-known memorization technique, and with enormous efficiency in the public speaking environment; also called the palace of memories or "loci" method, which in Latin means "places" or "locations." Our publication aims to carry out an innovative and in-depth methodological and pedagogical review of the orator's walk technique. A new version of 2.0 allows a much deeper and more efficient application. Which aims to display infinite and imaginative, pedagogical scenarios of concentration and memory for the speaker, incorporating novel experiential applications in persuasive environments of live communication.

Keywords: live communication, concentration, efficient conscious, speaker walk, mental, mindfulness

1. Introduction

For the optimal definition of the focus of our research, we temporarily centralize the quantitative and thematic coordinates between the years 85 and 86 BC. C. in which an adaptation of the pragmatic Greek teachings on rhetoric was published in the city of Rome. This field was organized into a set of guidelines for the practice of oral discourse for persuasive purposes. An investigation that tried to delve into the essence of the keys to verbal communication with full seduction and connection with the receiver. Scholars identify the development of a rhetorical consciousness in ancient Greece that reached capital importance in all social spheres, and which led to Hellenic oratory as a practice of good speech and good citizenship. It consists of

persuasive deconstruction from the composition of the speech to the brilliant staging. This approach later it spread to the western world [1].

The technique of the orator's walk, the palace of memories, or the method of "loci" which in latín means "places" or "locations", has its main origins in the fifth century BC, when the lyrical poet, Simonides de Ceos, was invited to a banquet in Tesalia (Greece) to recite some poems [1]. The narrative climax of the experience It happened when, during the celebration, they called him to go in the direction of the door of the temple, in order to receive a nominative message. At that moment, a transpersonal event takes place that is embodied as the inspiring backbone of the awakening of the orator's walk technique. While the poet Simónides attends diligently, and expectantly, to the exit of the enclosure, the unfortunate collapse of the ceiling of the dining room of the palace takes place.

This earthly annihilation ends up causing the death of all diners and guests, without having any choice of life, or possibility, of being able to recognize the identity of the corpses after the accident. Simonides found that he was able to remember, and locate, in his mind, very easily, where each of the guests was inside him, allowing the bodies to be identified with virtually no cognitive effort. The exact location of each meal before the accident had been established, and anchored, in a natural and spatial way, in the memory of Simónides de Ceos. With hardly any written records of the methodology, reviews appear in the anonymous Greek book La Rhetorica and Herrenium, specifically in book III, Section VI on memory [1] and in the work De Oratore written by Ciceron [1]. Also, many series and movies mention is made of it as in The Mentalist and The Silence of the Lambs, among others [1].

The speaker's walk method, "loci" or memory palace is conceived and designed to creatively stimulate human spatial memory. Creating an evocative journey made-up of infinite supra places, in a familiar and recognized environment, such as the home, or a well-known place with well-defined rooms, corners, rooms, chambers, ambiences, anterooms, halls, or rooms.

The primary objective of applying the technique is to stimulate our creative memory through the original creation of a spatial narrative. It is an exercise in memorizing each site of the mental palace through suggestive images, mirrors, surreal, funny, crazy, strange, ingenious, or even lurid. The use of creativity in construction is absolutely vital so that later they can be vividly remembered, and especially so that memory acquires an active but relaxed role [2]. When memory is transformed into compositional creativity, and the receiver appropriates each production, creativity appears, and memory takes on a much more active nature. Passive and demanding memory is disguised as creative and active attention. The rooms are imaginatively designed with a wide variety of well-known, evocative, and easy-to-see references, in such a way that the larger it is, and the more elements and accessories it incorporates, the more information can be accumulated in the memory palace.

Both to memorize and to remember, the method requires making an imaginary "journey" through a mental walk through the familiar place, always on the same route and direction, with the aim of passing and entering the multiple rooms and rooms to extract mentally stored information. A resource-based on the synchronization of data with known reference points, which uses the brain regions related to spatial memory to visualize, associate, and remember. If the technique is followed to the letter, a large amount of information can be remembered by mentally walking through the palace and collecting the objects to which the information has been assigned [2].

The fundamental objective of our research, called the speaker's walk 2.0, is a novel, and innovative, review of this persuasive public speaking methodology.

It consists of the creation of an original and experimental version, methodologically evolved, of the classic orator's walk. The transgressive core of this revolutionary methodology consists in the use of our own body as spatial support for the application of the "loci" method. The fundamental purpose is the use of our own body, with its infinite dependencies, as a canvas and cardinal narrative support for the creation of our technique of the speaker's walk 2.0.

2. Memory and communicative rhetoric applied to the method of the orator's walk 2.0

The art of memory is an essential piece in the oral persuasive process. According to the most classical research, there are two types of memory—one is natural memory, and the other, like the one at hand, is a product of technique (orator's walk 2.0). Natural memory is that which appears innately in our minds and is born at the same time as thought. Artificial memory is the memory that has been reinforced by certain learning and a series of theoretical rules [2]. In the same way, as in another aspect, the natural capacities frequently enter into rivalry with the acquired knowledge and the technique consolidates and establishes the natural qualities. The Rhetorica ad Herrenium also establishes that natural memory, when it is exceptional in nature, sometimes rivals artificial memory and, concurrently, artificial memory preserves and develops innate qualities thanks to the rules and methodology of art. Therefore, to achieve memory perfection, like natural memory, it must be enhanced with technical learning, the memory that is acquired through experiential learning requires natural qualities.

As in many other spheres of rhetorical efficiency, doctrine shines with the help of natural ability, and natural and innate qualities shine through learning. This bidirectional axiom becomes a sine qua non for the optimal application of our method of the speaker's walk 2.0 [2].

The investigatory study with special care of the environments and spaces that we have chosen is very important so that they are recorded and settled in us with clarity forever, since images, like letters, fade and are erased when they are not. Environments are used, but surprisingly, such as canvas or earth must endure. Traditionally, the first investigations indicated that to avoid any type of error in the enumeration of the environments, it was necessary to indicate ten by ten. In the technical process of applying the method, it is important to find semiological narrative connections of the nature of the content, form, cause, effect, color, texture, size, signifier, signified, ... The artistic ability to mesh with suddenly forming the evocative links between the concepts, will result in the natural unfolding of the brilliance of the application of the methodology.

A good memory palace is an imaginary place based on a building, house, or place that really exists and that we know well, with clearly defined rooms that are easy to memorize. Its rooms and corners must provide the necessary game when associating different mental images inside. It is preferable to choose these environments of deserted, open and immaculate places, rather than frequent, since the influx of people and starting decoration, with its nooks, comings and goings, alter, and weaken the features of the images [2].

On the other hand, in deserted and immaculate detail environments, they preserve their forms intact and the efficiency of memory lucidity is clearly increased when it comes to mental travel. It is highly recommended to choose environments that differ

and discriminate in appearance and nature so that they can be easily distinguished by their expressive diversity. For example, if someone chooses several cubes of bright color, in three dimensions, that represent an idea of segmentation of markets of a star product of a brand x, the resemblance will create such confusion that they will not know since they have placed in each environment and each space [3]. In this way, the mind will end up cognitively fusing the appearance of the concepts in each environment, and narrative confusion will be present.

When choosing a macro environment for creation, it is important to note that the environments must be small in size, but not excessively small. There is no direct relationship between the dimensions of the canvas space and the possibilities of spatial profitability of the concepts. There is no such space-efficient relationship since the important thing is the clear and meridian perception of the finite dimensions of the environment or the original canvas by the creator. With practice in the application, the longitudinal dimensions of the base environment do not matter so much, and the transverse depth allowed by the interspaces is much more important [2]. Therefore, if we choose an imaginative giant soccer field, as the primary environment for the creation and establishment of concepts, we can think in the first instance that it is a tremendously vast space to be able to include all the images-concepts that we need.

But it is a false perception, because the reality is that since the large dimensions of the environment do not contain potential discrimination, or morphological contrast in their environment, (far from the field lines) the possibilities to be able to anchor many concepts efficiently and lucid decline considerably. We must put the focus on an environment that is not excessively broad, but that, especially, that allows a clear and sharp divergent path for his rote storytelling in the execution of the oratorio [2].

This assumption is the conceptual basis on which the possibility of incorporating our body as a base canvas for discourse is based, and it is one of the vital factors of our method of the speaker's walk 2.0. It is also not advisable to select environments that are too small since, apparently, they will not be able to contain quantitatively too much image content. The surroundings should not be too bright, nor too dark so that the darkness does not obscure the images and the glare does not dazzle the mental journey [2]. For this reason, it is important that we use a medium luminosity so that the concepts can be anchored and settled, in a clear and lucid way. For example, if we choose the soccer field as the space or base environment, it is recommended that we choose brightness during the day and not at night; and if we apply it to our body, we better consider a medium-light that allows the clear drawing of our conceptual images in it [2].

On the other hand, to enhance our memory in this technique it is highly recommended that the intervals or the interspaces between the environments should be of medium dimensions, about 10 m if we make a forced adaptation to physical dimensions. Thought is like sight, which has less force when it moves away or when it gets too close to the object that it must contemplate [2].

Although it is easy for those who have a relatively broad experience to obtain as many environments and as appropriate as they want, however, those who think that they will not find sufficiently appropriate environments will be able to have as many as they want since the imagination can conceive any space to its liking, and form and build in it a fertile environment [3]. It is very important when choosing an environment that we manage to appropriate our own environment, that is, that we do not use a second-hand environment and that we make it our own, personalize it. For this reason, the location of the body as a creative parament is the maximum exponent of the living, lucid, and first-hand appropriation of the narrative of our rhetorical walk.

When we appropriate an environment, we achieve that attention is activated, not memory, and somehow, we avoid a replica [3]. Therefore, if the environments that are available to us in everyday life do not satisfy us, we can configure for ourselves an imaginatively adapted space, and have its appropriate environments, and easy to distinguish. By reproducing an environment automatically of reality, we are loaded with mental expectations and a little relaxed demand for the efficient practice of the process.

The pictures must resemble the objects, and for our own use, we have to choose similarities from all the words. There must, therefore, be infinite classes of resemblances, one with objects, words, textures, emotional sign (contractive or expansive), semiological, content, form, cause, effect, color, size, signifier, signified, ... Similarities with things are achieved when we form an image that conceptually summarizes through its visual identity the issue in question to evoke. Despite the fact that an image is a compressor and stopper of reality, we obtain similarities with the words when the memory of each name or each term is preserved, thanks to its image [3].

The memory that is located in the left cerebral hemisphere is passive and receptively very demanding. The attention that is located in the right cerebral hemisphere is active, creative, imaginative, and free of demands and conventions. When we see insignificant, ordinary, and habitual things in daily life, we do not usually remember them because there is nothing new or extraordinary that mobilizes our spirit. It is a way of stimulating the most passive area of our brain, and the beautiful cover of grace to the room of memory disappears almost before passing the threshold. It becomes a second-hand message, and the left hemisphere of our brain is activated [2]. But if we hear or see something that is exceptionally imaginative, creative, embarrassing, dishonest, unusual, great, incredible, and ridiculous, we tend to remember it much better, and for much longer. In fact, if we appropriate this concept, and give it a personal dose to enhance its qualities and give it our genuine perfume, it becomes an image that is very difficult for the brain to forget. In this way, memory is being activated through attention. For this reason, we habitually forget what we are hearing or seeing, immediately before our eyes, but we often remember perfectly what happened in an unexpected way in our past and in our childhood. This can only be due to the fact that ordinary things, concepts, and images are easily erased from memory, while outstanding and novel things linger longer in the mind [2]. Nobody is surprised by an apparently nondescript shower because it happens every day, but they admire a spectacular sunset on the beach because they will be experienced rarely. At this point, it is important to note that memory has a fascinatingly subtle relationship with one of the nine mindfulness attitudes that Jon Kabat-Zinn has investigated in-depth: "beginner's mind" [4].

When we deploy the beginner mind, we manage to activate a bridge between the rational left hemisphere (memory) to the creative right hemisphere (attention), which directly results in an exponential enhancement of our ability to be present, and globally in our systemic memory [5]. In addition, given that we promote the right hemisphere, which has a strong link with creativity, and with lower levels of expectations and demands, levels of self-confidence also increase considerably. That is to say, that the speaker who cultivates the "beginner's mind," through this bridge, does not demand himself in such an extreme way the millimeter verbal reply of certain words. Somehow in the left hemisphere, we find a single highway to reach the communicative destination. In contrast, in the right hemisphere, we achieve thousands of neural cerebral highways to reach the concept, and the image [5].

The "beginner's mind" consists of the attitude of observing, without judgment, "something" as if it was the first time, with great interest, and without being carried away by previous experiences or labels, ensuring that our memories, judgments, and previous experiences do not cloud what is happening "now." But regardless of this concept, which would deserve another considerably in-depth essay to delve into the effects on memory and mindfulness, the nature of our mind, under normal conditions, shows us that it is not sensitive to vulgar and habitual things, but that it is let you move by the novelty, or the extraordinary themes [6].

3. Primary environment for the application of the technique of the speaker's walk 2.0: our body

Traditionally, the body has been denied in the West, which has given greater prominence to the mind. The mind has been considered as the place where intellectual, creative, imaginative, and narrative life takes place. In fact, all the written records of the methodology of the orator's walk both in the anonymous Greek book Rhetorica ad Herrenium (Book III), and in the work De Oratore written by Cicero has always exclusively centralized the sphere of application in the mind and the creation of external spaces [1]. Of course, the application of memory storytelling for speakers has been thought to have its palace, or nerve center, exclusively in the mind [2]. That is why, since always, in the West, it has been thought that the body is simply a mere vehicle directed by the mind [2].

The predominance of the pragmatic oratory and the "loci" technique was exclusively hoarded in the mind. Eastern culture has always maintained a very different position, considering the body as important as the mind for the balance of the individual; and it is of much greater importance in applying the speaker's walk methodology. Current research by Javier García Campayo and Marcelo Demarzo supports the hypothesis that they defend the great importance of the body in our psyche, in our imagination, in our creativity, in our talent, in our security, in our emotions, in our way of life. Integrate and fully listen to the stories, and of course in our way of expanding our persuasive memory when speaking in public [1].

The ability to connect with our own body, in many cases forgotten, allows us a systemic fluidity of our entire being that inevitably redounds when speaking in public, and especially when remembering words, or images, of the "loci" method in which we are deepening. It is shown that Interceptive perceptions (bodily sensations, or abilities we have to listen to them) modify our thoughts and emotions in an important way. Having a direct and explicit effect on the way our memory behaves. In fact, there are studies that show that, if the usual posture is modified, simply by inserting a pencil in the mouth and introducing the smile, one finds the experiences, learning, and creativity more fun than if this modification is not made. The body, our posture, and breathing, therefore, form an essential variable when it comes to diving into the depths of our memory and emotion. Our proposal to focus on the conscious awakening of the body a sacred and experimental center for the application of the method is centered on this exact point. The use of the body as a setting, space, or creative canvas at the time of establishing the concepts, has infinite advantages to enhance our memory in the narrative discourse. It is about using our body as a great palace and anchoring the different images throughout its vast extension [4].

4. Presence and fear of public speaking

There are wonderful communicators with talent and charisma, which is indisputable, but many of them are caught up in that talent and charisma. We realize this because we perceive how they "hear" when speaking. Your presence can be shocking, but not transformative because it is a somewhat empty presence—they are only present with a part of their being, the intellect. People admire them and they may learn intellectually, but not grow. Moreover, they frequently generate a dependency on them. It is true that, in the early stages of life, this is almost inevitable but as adults, it does not help us much. When you speak from the head, you connect with the heads of others. When you speak from the heart you connect with the hearts of those who listen to you. When you speak from the presence, your words find the slit to penetrate deeper [7].

You can question beliefs from the head, empathize emotions from the heart, but only from the presence, a deep transformation takes place.

A nurturing presence is different from a pure charismatic presence. They can happen together, but not necessarily. Charisma comes from talent and skills. Both impress but they do not necessarily nurture. They can even generate jealousy or envy. So that you, presence nurtures the other and, rather than impress, inspire and transform them, you have to exercise your charisma and your abilities with detachment and with that internal quality so devalued that is humility. Remember that what you transmit "is not yours," it has been given to you; bring this to you, consciousness frequently because we tend to forget it.

Of course, it is smart to cultivate and improve your talents, if you appropriate them, if you attach yourself and become its owner, you are generating distance from the other, because there is "yours and mine" [8].

Maybe you will get the other to admire you, but he/she will not have discovered his/her way for himself to develop your own talent and find your answers. In fact, it will compare to you and you will probably feel inferior. In your message the "you can" must be very present that encourages the other to get going. It needs your testimony, not your Ph.D. [8].

You, like everyone else, have your own talents. Use them! But do not forget that they are the vehicle and not the end in themselves. Remember it and do not get lost in them. Do the best you can and nurture your talents but remember that the important thing is to stay connected to your essence. That is the transformative thing ... And it is not "yours," it has been given to you. It is not something you own, but "Who are you" under your disguise. Do not pretend to appropriate it, remain attentive and vigilant to be just the clean and truthful channel of it. Only then will you be a companion whose presence will help the other to discover their own essence [8].

Fear is a natural defense against what we perceive as dangerous. When activated faced with the possibility of speaking in public, it is because we consider this situation as something threatening. In general, in any new situation, fear appears; and, what it does when we go from being spectators to actors of something since it means one degree more or less important to expose ourselves. In the case of fear of public speaking, it is very present the feeling of shame, of not feeling capable, or the fear of doing it wrong and even to "go blank." It is what is called "stage fright."

Speaking in front of others happens like riding a bicycle—you only learn by doing it. It may be that the first few times it is something very uncomfortable, but as we expose ourselves, we will build confidence and learn. We will even be surprised

when, at a certain moment, we realize that we are enjoying it. Remember—you can substitute your avoidance responses for allowing yourself to be right with what you fear; then it goes changing and giving rise to something different. Breathe your fear, do not give it more power than you it has, and get through it by putting yourself into action. You can start with small auditoriums to go little by little [9].

In reality, the human being is destined, by nature, to communicate. Is not something strange but inborn? We communicate with words, gestures, and our actions. Through communication, we deliver and receive the best versions. We call it walking "communicators." Acquiring good communication skills and abilities requires training, but above all common sense [9].

Through the word, we connect and relate to others and the world. The word is the simple and prodigious means that allows us to get out of our essential solitude and "meet." What happens is that they almost never taught us to express our words in an auditorium. That is why the situation generates fear—we anticipate that they will judge us to us, not the act of speaking and how we do it. We identify with that action feared and then it is very threatening to us [10].

It is normal to feel nervous when having to speak in public.; and there is nothing wrong with it; in fact, is positive. Nerves make us alert and show that we are excited, and it worries to do well. The feeling is similar to that of enthusiasm. It depends on the perception. The enthusiasm captivates the audience. In fact, there is nothing more boring than a speaker who intervenes wearily and with a tedious routine [10].

When the emotion is too intense then it can be considered stage fright. Behind the stage fright is the fear of failure. The stress we feel before speaking in public can generate many reactions, at the level physiological, cognitive, and behavioral. It is a biological mechanism that releases adrenaline and cortisol [11].

The whole body becomes conscious. The body reacts as it reacts to great danger. Although Obviously, our lives are not in danger, but the brain interprets it as if we are facing a predator. So what instills fear are mental constructions about what we think it means to speak in public [6].

With fear or phobia, we can have physiological sensations such as sweating, heat, flushing, chills, stomach pain, leg stiffness, urinary urgency, involuntary movements, tachycardia, shortness of breath, hyperventilation, and many other sensations [12].

At a cognitive level, mental confusion, concentration problems may be noted. At a behavioral level, there may appear, among others, disturbances of motor performance to vocal and or verbal level—stuttering, shaky voice, involuntary movements, stiffness, etc. [13].

It is worth thinking objectively. We never play a lot in an exhibition. Almost nobody masters the art to perfection. Making a fool of ourselves is not something that should condition us so much, because: If we do not know the audience, they will forget about us after a while. If we know the public, they will not judge us for that moment exclusively. They probably have some sympathy or proximity to us, and we can then laugh with them at what happens [13].

Stage fright arises from a wrong interpretation, of aspects such as the underestimation of the own abilities or overestimation of the opinion of others.

4.1 Techniques before speaking: how to overcome stage fright and face an exhibition in public

- Changing the perception we have of what it means to speak in public. There is nothing out there; no predator. Stage fright is caused by our head. It is not a

threatening experience. Everybody is afraid to speak in public. They will empathize with our nerves, and they want us to do well. Take away your defensive attitude. Everything they can tell you or think you will accept; any negative attitude in the public you can understand it and approach it from the understanding. Do not be afraid of people. Think that you like people, each person [14].

- Preparing the intervention well: study your speech as much as you can until you can improvise. But the presentation should look like a fluid, natural speech, not something that you know by heart.

- Rich vocabulary: study well all the vocabulary involved in your speech, to be able to clarify, to speak properly. The speech will be less monotonous when introducing a wealth of words [11].

- Practice: in front of the mirror, record yourself.

- Eat well: a varied breakfast will keep you awake and active. Yes, you expose after eating, try to eat lightly. Caffeine stimulates but can aggravate nerves.

4.2 Techniques during speaking: how to overcome stage fright and face an exhibition in public

- Come early: to familiarize yourself with the place, greet and meet the people, creating a pleasant atmosphere. It will make you find yourself in a more friendly situation in which not everything is unknown.

- Take a deep breath before you begin.

- Relax your tense muscles: Jaw, frown.

- Be confident: not only the feeling provokes the action but the action also influences feeling; postures help us [11].

- Maintain eye contact: the moment of speaking before an audience implies a contagion of empathy and energy. Try to be there, with those people really, not before a nebula. Find eye contact with someone who is friendly to you [1].

- Speak slowly: saying little and clearly is always better than saying a lot quickly. Rhythm slow will also calm you down.

- Do not underline or lock-in on mistakes. Most of the public will not even be noticed.

- Bring a sheet of ideas or diagrams. If you go blank, you can continue.

- If they ask you, take notes. In the thread, you can go thinking about your answer, so structured.

- Thanks: to those who have invited you and the general public. Convert withdrawal to a smile.

4.3 Techniques after speaking: how to overcome stage fright and face an exhibition in public

Celebrates: Surely everything has been much less horrible than you thought. Celebrate it by telling a family member or friend. You will free yourself, and you will associate the trance with something positive [1].

Learn: Try to learn from experience, to improve next time.

Share: Post the experience on social media, send a thank you email, or some photo you took. It contributes to a congratulatory closing.

5. Methodology

Next, we establish the essential steps to apply the speaker walk technique 2.0, starting from the essential keys of the classic "loci" technique.

1. Conceptual rooms or environments: It is advisable that each room have no more than 10 objects. The more integrated they are in the places of the memory palace, the easier it will be to remember them. Our research has shown that in the first instance we can start with the identification of 10–12 points along the body in which to find the environments to anchor the different concepts and images. An example of this could be the following points: 1. Right foot, 2. Left foot, 3. Right knee, 4. Left knee, 5. Right hand, 6. Left hand, 7. Gluteal area, 8. Abdomen, 9. Chest area, 10. Throat area, 11. Eye area and 12. Crown area. This proposal is a starting point, but the experimenter of the speaker's walk technique 2.0 is invited to vary, freely, to other dependencies, rooms, or environments within the body where they feel comfortable and feel more inspired or identified. Regarding the number, it is important to think that any speech can very easily have 10 conceptual points on which the speaker is going to deepen, so we have optionally expanded to 12 to have enough travel to be able to place each of the concepts, and images, in the body. The classic version would be made up of 10 spaces, or stations. The difference lies in the omission of the stations of the circle of the knees, and we would go directly to the surroundings of each of the hands. The sequence would be as follows: 1. Right foot, 2. Left foot, 3. Right hand, 4. Left hand, 5. Gluteal area, 6. Abdomen area, 7. Chest area, 8. Throat area, 9. Eye area and 10. Crown area. We activate a process of micro-spatial introspection of body rooms, mentally analyzing each room or scene in our body, and visualizing the details they contain to see the routes [15].

2. Narrative itinerary: choose the starting point and the itinerary to always walk along the same visual route. As we have mentioned previously, the order is confirmed as a capital factor in the practice of this method, therefore, we must respect that the starting point of the route, or the mental walk, is born from the most earthly area (foot area) and goes ascending to the highest dependencies of our temple (body). Following the methodology of the classic writings on the pragmatics of the speaker's walk-in its classic version 1.0, what we will do is activate a mental journey through our body, to go through each of the concepts in each of the environments, scenes, or defined spaces. In this way, there is no possibility of being able to forget the presence of any concept in the narrative of our mental "journey" [16].

3. Conscious selection of your 10 main ideas to transmit: selection, by the speaker, of 10 conceptual ideas that he/she wishes to communicate in his/her conference, appearance, class, meeting, etc. The fact of simplifying the rhetoric into 10 concepts has a double meaning, on the one hand, establishing a decalogue gives it a certain systemic, global, esthetic, and marketing circularity. On the other hand, the number 10 is associated with leadership, determination, confidence, and independence. A symbol of positive attitude and optimism, it is also a number of precision and perfection. Regardless of this, if the experimenter of the technique wishes, he/she can considerably expand the number of conceptual stays perfectly and legitimately, since the possibilities of anchoring in many external and internal areas of our body are endless [16].

4. Naming of each room: in this stage, there is a simplification and synthesis of the concept developed and expanded to a word that represents the complete idea, quantitatively reduced. The fewer words the naming contains, the greater the depth of the identity of the concept. It is important that we differentiate between the concept of simplification and simplicity, although the esthetic appearance is the same. Doing things simple requires great intellectual effort, not casual, and yes causal, abstraction, and reverse layering until reaching a supreme final coating. Instead, a simplistic concept is based on finding casual, noncausal shortcuts that approximate the expected solution, but ultimately build a weak turret on the verge of collapsing at any moment [16]. Simple concepts have foundations to grow, and simplistic concepts lack them because there has been a creation with abbreviations in the construction. The idea is to have 10 keywords that have the depth of travel for the speaker.

5. Iconic coding: in this phase, we proceed to launch the inspiring and creative art of translating each of the keywords into concepts in images. Regardless of the virtuous cultivation of the visual mindfulness attitude "beginner's mind," which we have mentioned, in general, and when applying our methodology of the speaker's walk 2.0, we must be aware that we must raise images of the class of the that can be stored for a long time in our memory, and that have doses of appropriation bathed in imagination to stimulate creativity, and turn passive second-hand memory into active first-hand creativity [16]. Inserting details in the room or the environment, to involve the senses, with sounds, smells, colors, or sensations will also attract the memory, intertwining with an excellent network of mental associations [16]. We will achieve this by establishing as imaginative, stark, and brilliant similarities as we can. Using images that are not seemingly ordinary, plain, or ethereal, but rather represent something sublime. Confirming an exceptionally high beauty, or a singular ugliness, embellishing some for example with flowers, capes, auras, diamonds, or sacred dresses, ... in order to better retain their resemblance. Shaping others exaggeratedly, for example representing an object stained with mud, milk, blood color, or painted red so that its appearance is more elevated, amplified, and striking. Attributing funny features to the images, full of humor, because this resource will also allow us to more easily preserve their memory and connect with our right hemisphere. When making the mental walk of the rhetorical route of our memory storytelling, it is important that it is reinforced by a hyperbolic enlargement so that it sits in the parador of our creative right hemisphere. If the images are well characterized, imaginatively exaggerated, with a subtle and clean semantic link, firmly anchored and lucid, between concepts

and images, it will not be difficult for us to remember them [17]. In this way, the true essence of the method comes to light and acquires its maximum value when it allows us a pleasant liberation from the use of any role on stage [18]. Creative art of free, with full confidence and determination of the speaker in the present. Through our method we manage to automatically convert abstract or symbolic objects in information and spatial anchor for the speaker.

6. Connecting links: linking the data, and information to be memorized, with the palace of our body, route, and details in an original, exaggerated, strange, unusual, absurd, or even ridiculous way to achieve an easy-to-remember combination [19].

7. Recurring qualitative-experiential journey: visiting our body-palace from beginning to end (we always remember respect for order, from the lower rooms to the upper rooms) to ensure the relationship, order, directional rigor, and link between the elements. The itinerary is traveled following a specific established path. Memorizing the walking path mentally is an important preliminary exercise to avoid possible blockages in the scene of the present moment [20].

8. Recurring quantitative-experiential tour: tour the palace as many times as necessary. To fix it in memory normally with a couple of times, accompanied by a couple of conscious breaths, it is more than enough to retain it in memory and rest for a long period of time [21].

9. Monothematic stays in the psychobody: monothematic rooms are recommended, with open spaces and a decoration capable of being remembered. The more eccentric, the better. Our minds better retain the most extravagant situations. The more surreal it is, the more hook it will have and the easier it is to remember [22].

10. Emotional compositional recommendations: the use of personal affective creations considerably increases the levels in our memory. Images that involve a loved one are extremely effective, as well as those that provoke an emotional, contractive or expansive reaction, which will remain etched in the memory.

11. Activating flow: the rhythm and speed of memorization are achieved by practicing mental mechanics exercises and gaining experience with long lists of names or numbers [23]. It is important to be aware that virtuous activation resides in the persevering exercise of the mental journey, repeatedly. A complete, fluid and fast route, from the initial spaces, to refresh and anchor the concept notes as a single complete and holistic symphony [17]. This active synchronization process could become more natural the more it is practiced.

12. Experiential reestablishment of the canvas in our body: the art of breathing management is conformed as a harmonic and interoceptive vital process of the anchoring of each concept [24]. We are not going to delve into this section because it would take us to another investigation to analyze the profound and beneficial effects that conscious management of breathing has on memory at the time of the staging of the speaker's walk 2.0 [25]. We simply mentioned that to be able to erase and eliminate the objects, images of the palace of our body, it is enough to mentally repeat the empty path several times accompanied by our conscious breathing in each of the rooms [25].

6. Discussion

As a core discussion of our research, we can evidence that we have discovered the creative and pragmatic essence of the novel Paseo del Orador 2.0 concept. The fundamental objective is to design a methodology with an empirical program for the optimal use of the methodology for rhetoric and the art of persuasive communication in public.

From a scenario of discussion of the main analytical paradigms of the object of the study investigated, the main benefits of our speaker walk 2.0 methodology are as follows:

1. In addition to the logical rhetorical application in public communication scenarios, in which the speaker wishes to rigorously expose a series of communicative concepts in order, without having any type of paper support, our technique is very useful to remember everyday tasks without having to wear them pointed at all times, allowing it to be deliberately used at specific times. Especially fruitful is its use in work meetings, or personal, in which you want to focus verbal attention on a series of key points to address before the meeting. Maintaining your floating presence during it to be aware of the points that have been developed, and which have not. In this way, the experimenter can have a conceptual script in the background, on the screen of his/her mind, to be able to centralize and re-establish the rhythm of the waves of dialog, interview, meeting, consultation, ... without having to check manually or by hand the possible resolution of each matter. In addition, it is a proven, and valuable, a mental resource for students, and especially for opponents of all levels, which will save them effort and time, positively redounding in their academic results and intellectual productivity.

2. With practice, the experimenter is able to memorize a higher quantity of qualitative and quantitative content in much less time, and since the brain spaces of the right hemisphere are conquered, the way to reach it is much more lively, pleasant, and lasting in long-term memory. Therefore, the daily training of the 2.0 speaker's walk technique can have a very positive impact on the prevention of possible cognitive deterioration of the mind, attention, and memory-related to its insubstantial use, or with the advances of the years.

3. The implementation of the method is anchored in the canvas of our body, and since it does not need any additional material for its implementation, or special atmospheric situation, it can be used as a memory resource at the desired moment by the experimenter.

4. It is important to focus the idea of the living creation of each concept, through the tangibility of the senses. As we can let the chosen concepts land on, and are expressed, through the explicit channels of our sensory sensations, the chances that they will settle, slowly in our memory, is much higher. When we have a concept anchored in a part of the body, no matter how abstract, sophisticated or refined, it may seem, we are always able to materialize it, and make it corporeal through the sensory texture of the senses.

5. The invitation lies in the translation and objectification of a concept drawn on the canvas in our body, through the infinite brushes of the senses. For example, being able to materialize the concept through the sense of smell-smell the

concept, be able to feel the fragrance of the idea, and let it rest on that part of the body as a narrative showcase. When we can reify, or deify, the idea through the sense of smell, the chances of it being forgotten are greatly diminished. Mainly because we are creating a concept and we are not memorizing it. Memory is much more passive, and when we are creating it, we are working on deliberate attention that is much more compositional, and spatially inspiring.

7. Conclusions

1. We can conclude that the application of the 2.0 speaker's walk technique allows us to remember iconic and textual information without apparent rational logic or linear sequence. The spatial narrative methodology of the technique itself relates the segments and conceptual pieces of information, in a high-definition setting, and is capable of creatively expanding, and raising our cognitive capacity of semiological relation to memorize.

2. There is no condition whatsoever that limits the application of the technique to a specific qualified practitioner profile. Anyone can use it, regardless of cultural level, age, level of emotional intelligence, experience, or profession, etc.

3. The use of the body as a cognitive narrative setting of the technique allows the possibility of varying, or expanding, its structure by creating new rooms, rooms, spaces, environments, or buildings. The design of the walk and the content expressed in the rooms do not contain any limits, there is only the infinite imagination and ingenuity of the experimenter.

4. We can conclude, from our research, that the exaggeration of visual size, in the creation of the concept, at the time of applying the technique, causes the expressed idea to be deposited, and rest, in a scenario of an amplified version in high definition. In this way, when we make the walk of our mind through the different parts of the body, it is the concept itself that finds us, and we are not the ones who find it. This change in the vectorization of our mind at the time of mentally relating to the concept frees expectations and possible, self-demands that usually have an inversely proportional relationship with our memory. We can appreciate this phenomenon in opponents who tend to have a concept search perspective and not so much allow concepts to find them, although for this we must lucidly shape the concepts in each part of our body as if we are building esthetic stations for that our train can stop at each of the concepts and semantic stations.

5. As an important point in the conclusions of the first phase of our research, we can determine the importance of the subtle compositional interconnection between horizontal concepts in the body. In this case, we refer to the concepts located in the feet, in the hands, and, as a vertical vector, then in the spinal column of our body. The ideal is to look for an invisible subtle semantic and meaning thread that connects the two concepts, so that at the moment that we can cognitively construct the idea, there is a narrative link that stimulates interconnection, and interdependence, with its spatial namesake in the body. If, for example, on the canvas of the right foot we place a drawn concept that represents the idea

of digital pedagogy, as a thematic axis, and we do it through the formalization, or objectification, of a tablet or digital device, located on top of the teacher's platform, we can see the possibility of infinite channels of subtle communication unfolding with the concept of the left foot. For example, if on the left foot we must insert a concept such as emotional intelligence in the classroom, we can represent it with an illuminated heart sitting on one of the desks. In this way, when establishing the two concepts in the body, we can create a common thread between both ideas so that they do not lose their location, and we have a kind of subtle internal compass that is always interconnected and interdependent, that allows a guiding semantic plus in the recreation of the concepts. In this case, it may be a spatial connection since, if we see a tablet on the class platform on the right foot, we can amplify the camera or our gaze, and see how that seated heart appears in one of the desks in the first row at one of the tables in the class. In this way, each concept has independence, and cognitive autonomy in our creation, but it also exists.

8. Future directions

The next and future main lines of research would be the following:

1. Change of vectorization in relation to the concepts created. A possible bibliographic inquiry to delve into the change of cognitive vectorization, in it we place the activating point, not in the creator emitter, but in the created objective itself, which finds us. To be able to delve into the characteristics that influence when the ideal scenarios are produced so that it is the created conceptual object itself that approaches us, and finds us, and we are not the ones who insistently seek the created conceptual objective. As liveliness, genuineness, uniqueness, auditory, olfactory, visual, taste, and texture sensoriality become much more lucid, the redundancy about the paradigm shift is clearly increasing. Delving into this initial hypothesis supposes a radical change in the optical dimension of the creation of the concepts. Through this paradigm shift in the composition of concepts, we manage to release expectations and memory self-demands (left brain hemisphere), and we are ready to enter a compositional space, much more systemic, trusting, and liberating. Investigating in-depth in this change of focus allows us to penetrate attentional levels of understanding about the scene that is much more interdependent and artistic for the speaker. Creation of the setting and the idyllic attentional atmosphere, so that we find the concept that we were looking for.

2. Music and synchronous breathing as an inspiring pattern and activator of creative processes for the application of the speaker's walk method 2.0. The process it consists, in the first instance, in slowly and consciously drawing with our mind the concept of a chosen form or word to the rhythm of a song, or melody. In this way, inspiration guides the mind in its creation, and we rhythmically accompanies the creation and depth of the calligraphic stroke of the speaker 2.0. It is important to trace the concept on the blank canvas of each part of the body in which you are going to allow it to rest in a cyclical and harmonic way, depending on the rhythm, or musical pattern, of the song. Through the incorporation of the variable of respiration, for example, the sequence inhalation, the creation
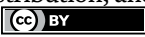
of the concept, retention, seats the creation on the canvas, and exhalation, we release the focus of the image, but the concept settled on that canvas of our body. The essence is that the speaker feels like a genuine cartoonist and a deep musical creator who draws concepts and words on the screen of your mind through the art of harmonic breathing. The art of drawing and evocative writing conscious of the speaker 2.0 walk through rhythmic breathing and inspiring music. The first investigations that we are conducting on this novel next line of research are allowing us to glimpse, in the first instance, two first metacognitive application scenarios. A special fluid first stage of the composition of the speaker's walk 2.0 allows a production of our speeches that is especially intense and lively, which results in highly fluid and stimulating memorization. In the second instance, the use of music as an empty stage to be composing in real time, as an improvisation with a musical rundown, on the inspiring and environmental elements that the speaker is, allows, in addition to being a highly stimulating method of our concentration. It becomes a tremendously practical method to relate to creativity from a much healthier perspective that deconstructively allows us to release our creativity rather than build it. This implies a relationship with less involvement in linear expectations and classical memory and connects us with a singularly more imaginative memory that allows it to be transformed into a genuine, inspiring, and interdependently creative compositional attention.

Author details

José Jesús Vargas Delgado
Universidad Europea de Madrid, Madrid, Spain

*Address all correspondence to: jjesus.vargas@universidadeuropea.es

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Chapter 8

From Gamification to Serious Games: Reinventing Learning Processes

Cirit Mateus De Oro, Daladier Jabba Molinares,

Ana María Erazo Coronado and Rodrigo M. Campis Carrillo

Abstract

Virtual games represent one of the most important contemporary possibilities to enhance learning processes in educational environments. There is ample evidence of their applications in teaching cultural aspects, citizenship, science, and the development of critical thinking, among many others. However, despite the scientific support, many questions arise about the effectiveness of gamification in education. Most studies and reviews of empirical studies on gamification indicate that they generally have a positive effect on motivation, concentration, and other cognitive aspects, as well as on interaction and prosocial behavior. However, there are gaps in terms of purposes and outcomes between gamification and the application of serious games. This is a review aimed at elucidating these differences, to argue for the reinvention of educational processes.

Keywords: gamification, edutainment, serious games, education, learning innovation

1. Introduction

According to AlMarshedi et al. [1] the term *gamification* refers to the use of game development elements and mechanisms in non-game environments. This derives in several streams, among them, edutainment, and serious games. As for edutainment, AlMarshedi suggests that it is primarily a motivational tool that combines the principles of engagement, reward, and incentive. The use of this tool encourages changes in behavior through play, motivating users to learn new skills or increase their participation. This generates possibilities of behavioral change and capabilities, accompanied by the element of enjoyment it brings. It is in this way that gamification can help to achieve predetermined objectives.

In the twentieth century, J. Piaget, and L. Vigotsky started the trend of highlighting the importance of games in human learning and in personal cognitive development. Since then and from the development of their theoretical elaborations, it is understood that learning based on play is concerned with investigating the forms of interaction between play and learning. This produced a way of conceptualizing education that

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today has a long tradition. However, what those authors could not foresee is the enormous incidence that the vertiginous development of technology has today in every aspect of human life, including education.

Framed in the Internet era, a space of convergence between education, digitality and games arises, giving way to edutainment. According to Shaffer et al. [2] this is described as a type of game with defined learning outcomes. In this context, games present clear objectives that are divided into achievable short-term goals. They give a seamless sense of player progression, providing frequent rewards that act as external motivators.

In addition to motivation, video games provide a fictional context in the form of narratives, graphics and music that foster players' interest [3]. Due to the improvement of the supporting technology, this interest is furthermore growing for the individual and extends to wider and wider population groups. Because of this potential, a great deal of work has been done on ways in which video games can be successfully used for educational purposes.

According to Mejía and Londoño [4] virtual games represent one of the most important possibilities for learning processes in children and adolescents. They warn that these games can be applied in fields such as the teaching of culture, citizenship, and social sciences, among others. Despite these findings, questions arise about the effectiveness of gamification in education. Most studies and reviews of empirical studies on gamification indicate that they generally have positive effect on motivation and behavior [5–8].

In gamification, it is generally observed that there is a greater possibility of engagement and ability to connect with intrinsic motivation. This simultaneously favors the production of cognitive, emotional and social benefits [9–11].

On the other hand, Connolly [12] presents a systematic review of the literature on game-based learning, focusing on the attainment of empirical evidence. In his results, he emphasizes the need for more rigorous evidence of the effectiveness of games and their real impact. This implies a significant questioning of the results and conclusions of previous research on the subject based on the questioning of instruments and techniques of data collection and analysis.

On this situation, it is illustrative the appreciation of Jagušt et al. [13] in which they state that:

> *Despite the growing popularity of gamification in educational contexts, there is a paucity of empirical evidence investigating under what conditions and how gamification works or fails. A review of existing research shows that the impact of gamification is often assessed through self-reported measures relating to an individual's perceptions and attitudes through survey instruments (p. 446).*

Beyond the above, some educational researchers observe this type of entertainment with great interest. De-Marcos et al. [14] asserts that video games are interactive activities that continuously provide challenges and objectives to players. This implies an intentional learning process to acquire progressive mastery of the game mechanics. In the same sense Busch et al. [15] present the results of their experiment. In this experiment, the researchers used games from a web platform for an e-learning experience—gamified—and evaluated it. Their findings suggest that the platform serves as a collaborative database where students could create and answer questions, using it as an alternative way to study and review geography and mathematics topics, among other content.

Thus, it is difficult to judge definitively the positive, negative, or neutral nature of the inclusion of games in educational environments. However, it would seem that research findings are pragmatically divided into two large groups: the first, broad, which usually concludes that games are effective and the second, composed of those who attribute to flaws in the game design and not to the platform itself when the results of the edutainment application are not as expected [5–8].

Despite these discussions, the educational field is not exempt from the use of video games and in Latin America in particular, the approach to this issue refers to figures of recognized trajectory in the field of communication. In this sense, Orozco et al. [16] argue that the playful part of learning leads to inadvertent learning. They argue that children obtain them from video games, for example, when they are able to remember sequences in the controls, passwords and tricks that allow them to improve their skills or eliminate obstacles in the video game. In other words, even though these games are not intended to educate, they end up doing so.

This way of educating by playing also produces *relearning,* which is understood by Orozco as "creative and useful extensions of unnoticed learning that are produced consciously and deliberately with the aim of expanding the educational process of video gamers" (p. 11). However, superimposing edutainment on education requires a complex study of the intervening variables and their characteristics. That is why this proposal, although important, requires an experimental work that also allows a wide control of variables to obtain reliable results.

In this sense of control of variables, Scolari's [17] conceptualization of some characteristics of edutainment or gamification deserves special attention. In his opinion, these characteristics are fundamental and refer to digitalization, hypertextuality, reticularity, interactivity, and multimediality, to which he then adds virtuality, non-sequentiality and modularity. To these can be added the principle of multiplicity described by Calvino [18]. This approach is consistent with the fact that these processes have "a *fractal-like*, network-like mode of organization, that is, where all connections are revealed as constituent parts of the network, in an indefinite way" (p. 25). Consequently, the various formats make possible the hypertextual chain made up of images, sounds, messages and other digital forms.

This perspective implies the transformation of human thought. This leaves behind univocal explanations, closed models and the great truths consigned in books. From this perspective, knowledge is built from the fragment to the complexity and vice versa, but without a linear order. Thus, knowledge is constituted as a network that is woven in each of the *turns* or appearance of each fragment. In turn, each fragment or piece gradually configures a relatively complete image. This conception breaks with the idea of a traditional program or curriculum, basing the possibility of human learning on the bond with others. This finally invites us to think of communication as a mediator for learning.

2. Edutainment

According to the theoretical review, edutainment implies the design of new educational environments, duly articulated to some objectives and the tools offered by communication to promote the integration of knowledge, dialog, interaction and cognitive development of students. Therefore, it is necessary to adjust the conceptualization inherent to the traditional educational environment, including the notion of *authority*.

In this order of ideas, the characteristics of the new media and of the current forms of interaction between agents tend to eliminate verticality in the relations between these agents (educational community). In the same way, it cannot continue in the blind acceptance of the book and the teacher as the only legitimizing sources of truth and knowledge [19]. Therefore, instead of incorporating technology into traditional pedagogical processes in a vague and disjointed manner, we should promote a pedagogy that broadens the univocal vision of its functioning. This is achieved when a dialogical perspective is assumed to generate new forms of encounter with society and culture within the framework of the contemporary context, that is, between screens.

It is clear that the full and articulated incorporation of screens, games and, in general, the bet of edutainment in educational institutions, is a major challenge for contemporary educators. However, success in this task surely allows for new ways of accessing and generating information and knowledge. Edutainment makes educational events more flexible, transforms, changes perspectives, and extends the scope of educational events. In short, it promotes the search for new alternatives in a series of variables and dimensions of the educational act.

This leads to the delocalization of knowledge for the use of different communication tools and for the interaction with different types of codes and symbolic systems. As the most important achievement, edutainment also leads to the choice of the formative itinerary, of strategies and techniques for training and to the convergence that favors access to multiple sources of information. Finally, with this form of screen incorporation, different forms of content, but also of human relations, are complexified and articulated.

Precisely, the incidence of this tool in social interaction forces us to proceed with caution. Buckley and Doyle [20] suggest that the research carried out so far on the effectiveness of edutainment in an educational context should be assumed with prudent caution rather than with absolute optimism. To this end, more and more comprehensive research is required to examine the variables involved in the educational process and the context in which it takes place; learning styles or personality traits, for example, are part of these variables. Their consideration is important because sometimes success can be mistakenly attributed to an edutainment strategy that can be better explained in terms of these variables.

In summary, more research is needed, but especially longitudinal research. With this, it is possible to demonstrate with empirical evidence the relationship between the use of the tool and the behavior generated during the game in students to make valid inferences [16, 20]. It is equally important to clarify that edutainment does not get to build an experience through mechanisms based on theoretical frameworks. It uses aspects of play mechanisms to mediate an activity. It may include motivation or competition (which are game mechanisms), but it does not go so far as to include mechanisms based on social theories in an intentional or specific way.

3. Edutainment, emotion, and learning

According to González and Blanco [21], emotions can have a positive or negative influence on learning and, above all, on the motivation to learn. Whether or not a student feels motivated to learn something is one of the keys to autonomous learning. In a similar vein, Domínguez et al. [22] insist that it is necessary to focus on the fundamental elements that make games attractive in order to create an edutainment

system that increases student motivation. In the same sense, although for them the reward system is not the only element, it is highly significant.

At this point, the issue that calls is the emotional aspect and the impact that this aspect would have on the tendency to do or repeat something. On this issue.

Csikszentmihalyi [23] highlights that the fact of experiencing the notion of success depends on the ability to concentrate on something. This concentration must be sufficiently intense to lead the individual to abstract from himself and the situation he is living. In this state and in the same sense, this sensation is accompanied by another of clarity in relation to what one would like to do next, due to the immediate feedback offered by the experience itself. All of this is framed in the full conviction of how possible it is to accomplish the task, even if it might be difficult or arduous. When players set out to accomplish the goal that the tasks entail, the natural tendency is to stay with the activity with a high attitude and positive emotional response.

Games also tend to incorporate reward systems that promote and enhance positive attitudes and emotions, giving immediate recognition to the player's success. It is usual to use reward systems for points, trophies or items that can be acquired for the development of more complex tasks within the same game. Similarly, in the opposite case, that is, when a task is not successfully completed, the player is expected to experience some anxiety.

A certain degree of anxiety is acceptable, but it should be avoided as much as possible to turn it into frustration, as this could lead to abandonment of the game. To avoid this, it is preferable to design the sequence of tasks to suit the skills of the player at any level. It is also advisable that the penalty for each failure be significant enough to be recorded, but also low enough to ensure repeated attempts to complete the tasks. If this transition between failures and successes occurs in a balanced way it is very likely that the player will acquire a level of performance that is, in itself, highly motivating and promotes a balance in emotional tension.

Van Roy and Zaman [24] measured the effects on emotions and motivation of games. They analyzed a 15-week university master's course in which students interacted voluntarily with a gamified platform. Their results highlight a potential for ambivalent motivation toward the game elements incorporated into the platform. In some cases, they enhanced feelings of autonomy, competence and relatedness. In other cases, frustration was a priority.

As a derivation of the study, the authors suggest that this ambivalent motivation depends directly on some situational factors that play an important role in this process. Finally, it can be concluded that there are several factors involved in the positive or negative emotional impact of the use of gamification. Some are intrinsic, that is, they depend on the subjects who participate in the game (personality, emotional stability, etc.).

Others depend on the structure of the game, the relationships that are established with peers, the mediation of the teacher and even the culture and the way in which social ties have been woven in each human group participating in the process.

4. Edutainment and human interaction

Screens have transformed human relationships, but in relation to human interaction, what good has it done? For Petrucco and Agostini [25] the measuring stick is essentially that of Vygotsky. According to her, humans learn from our surrounding world through instruments and artifacts that increase the zone of proximal

development. Screens are, of course, part of these instruments and can—perhaps should—be linked to the very design of educational environments as something more than a simple medium. This implies the possibility of constructing spaces for learning or knowledge construction that are based in an important way on social interaction.

This appreciation is theoretically sustained in the formulation of the genetic law of cultural development proposed by Vygotsky [26] where he assures that:

> *Every function in the cultural development of the child appears on the scene twice, on two planes: first on the social plane and then on the psychological plane, at first among men as an interpsychic category and then within the child as an intrapsychic category (p.94).*

Taking this assertion to the field of the development of educational events, this law leads to the acceptance, as a principle, that all higher functions of human intelligence originate from relationships between human beings. The medium for this interaction is based on language. This means that the dialog, the collaborative workspace, and the interpellation to the other propitiates the introjection and consequently the learning.

Monereo [27] argues that the intrapsychological mental scenario should also be treated as a space of dialog, that is, as an interpsychological space. This space arises in games, be it in the manner of an opponent, a playmate, team, etc. Caillois [28] proposed that, no matter how antigregarious a game or the devices used, a competitor or opponent is required. Thus, from the social aspect, the game institutes a link between subjects. Competition, the exploration of tactics and the tension that this generates are present in social actions as part of a culture that seeks to establish relations of interaction with the other.

A derivation of this social condition consequently refers to the issue of collective performance. According to Jenkins et al. [29] this makes it necessary to explore the culture of convergence. In this conceptual framework, the concepts of collective participation and collective intelligence are articulated. Convergence is defined by Jenkins et al. [29] as the space where the old and the new converge. In this space, different content and different media platforms mix, where technological transformations with their concerning cultural and social consequences follow one another. They include subjects who search for information and make connections between different content spread across networks and media platforms. Jenkins et al. [29] also propose that in participation producers and consumers converge, transforming the passive role of the media spectator. Thus, participation-mediated convergence occurs in the brains of individual consumers and through their social interactions with others.

On the other hand, it is convenient to incorporate at this point the definition of collective intelligence by Lévy [30] who identifies it "not as the fusion of individual intelligences, in a kind of indistinct magma, collective intelligence is a process of growth, differentiation and mutual reactivation of singularities. It constitutes for the collective a new mode of identification" (p. 35). Later, the same Levy assures that it is "the mutual valuation and impulse of the particularities of each one" ([31], p. 103).

Currently, management proposals based on collective intelligence (CI), have as key factors interaction, interactive learning, distributed collaboration, and the valorization of knowledge in all its dimensions [32]. All of the above leads to ensure that convergence in participation occurs in individuals through their social interactions with others. The consumer of information resignifies it from his own cognition and subjectivity and returns a construction that enters to conjugate with that of others. The result is an

interaction of knowledge that structures a new form of social relationship, mediated by technological support. It allows the navigation between knowledge, because it constitutes the formalization of the "ideal of scientists, artists, entrepreneurs or network activists who want to improve the collaboration between people, who explore and make live different types of collective and distributive intelligence" ([31], p.8).

An example of this type of collective construction is crowdsourcing, a term that according to Uhlmann et al. [33] was coined by Howe [34]. Crowdsourcing refers to a random open call, to find among amateurs the proposal or solution to a certain problem, focusing on collective intelligence. Based on these concepts and on the vertiginous development of digital media, edutainment has found multiple ways of creation, reconstruction, transformation, as well as a multiplicity of meanings and interpretation edges. Today, collective or collaborative learning has become a fertile field for the approach of contextual problems and the search for their corresponding solutions.

Likewise, edutainment has begun to become a tool for the achievement not only of learning objectives but also of social transformation.

5. Edutainment and motivation theories

The human predisposition to play games is associated with their motivations for action. In gamification, both motivational options are evident in different forms. Yildirim [35] conducted a study with 97 participants (49 in the experimental group and 48 the control group) and found that gamification-based teaching practices have a positive impact on students' performance, attitudes, and motivation.

One explanation for why games offer a captivating and immersive experience is the flow theory [36]. Flow is assumed to imply "a state of mind characterized by focused and heightened concentration and enjoyment of intrinsically interesting activities." According to Mejía and Londoño [4] games enhance immersion in technological environments, prioritizing audiovisual languages and interactivity between members of a network of contacts, through the flow of information between people focused on the activities of the game. For Esnaola and Levis [37] the characteristics of flow experiences, typical of informal learning in video games, are as follows:

- High levels of concentration, enjoyment, and commitment.

- Immersion or loss of self-consciousness.

- Focused attention.

- Positive feedback.

- Intrinsic motivation.

- Clear ideas about the objective of the activity.

In the framework defined by Chou [38], the set of stimuli and motivations that can be included in a gamification strategy are divided into different types and have different applications depending on the type of desired outcome. Chou's model, called Octalysis, classifies the types of motivations that can be used in edutainment categories (**Figure 1**) [39].

Figure 1.
Octalysis of motivation types. Source: Coronado and Vásquez [39].

Coronado and Vásquez [39] propose that one of the most interesting elements of the model is that motivations can be grouped and divided into positive (white hat gamification) and negative (black hat gamification). An additional reading of the motivations provided by Octalysis is that some of them are intrinsic and others extrinsic: The right side of the octagon (empowerment, social influence, unpredictability and some elements of avoidance and meaning) contains intrinsic motivations related to creativity, expression and social relationships, while the left side (achievement, ownership, scarcity, and some elements of avoidance and meaning) includes motivations associated with calculation, logic and properties, that is, depending on external stimuli.

6. The contribution of persuasion theories and serious games

Generally speaking, information technologies and Internet-enabled technological devices transfer values, nuances, and ideologies to people of diverse cultures, social classes, and ages around the world. This leads to a transformation of characters, folktales, and urban legends that pass-through media filters.

The influence that unfolds over consciousness through the transfer of ideologies in the media can be of such magnitude that many institutions can instill ideas that influence thought and can come to affect human actions. These institutions can refer to large corporations, political apparatuses, states, and the larger ideologies of society. As media logic and discourse influence more experiences, our words become fully mediated [40].

The issue functions in such a way that even if consumers or audiences do not in principle share an ideology or openly object to it, exposure to it can generate future incidences. This is especially so if we are clear that the self is vacillating and manageable and is not a fixed structure. Altheide [40] warns in this regard that the social order is increasingly a mediated order, and any serious attempt to understand contemporary life cannot avoid this fact and its implications. Martín-Barbero [19] predicted this many years ago when he expressed that a mass medium is not a vessel that carries ideas from one place to another, but is itself a subjective, interpretative, and ideological form.

For its part, storytelling is not only a central element of human culture, but it replaces or replaces direct experience as a source of socialization. It has the capacity to engage or provoke a high emotional involvement in the audience and to provoke strong emotional reactions. Finally, it allows incidental learning of attitudes, beliefs, and behaviors [41].

These assumptions are based on the Socio-Cognitive Theory [42, 43]. This theory supports learning processes of new behaviors through the observation of symbolic models. However, it is proven that behaviors are not learned indiscriminately. Motivation and affect, among other factors, are involved in this process. On the other hand, it has been confirmed that the model is not enough to achieve objectives such as the promotion of prosocial behaviors [44].

Igartua [41] describes Slater & Rouner's model, explaining that persuasive messages and edutainment content are not processed in the same way, since the goals and motivations are very different. Thus, compared to a traditional persuasive message (such as an advertisement in an information campaign), a basic motivation or processing goal is to develop correct attitudes for a particular topic. In this context, the level of involvement with the issue addressed by the ad plays a central role in understanding how the persuasive process will occur.

If the message is related to a topic relevant to the person, there will be a systematic, intense and careful processing of their arguments (central route). However, when the message focuses on a topic of low relevance, the individual will not develop such a careful or systematic processing (peripheral route; [41]). Along the same lines, the consumption of narratives exerts significant effects beyond pure entertainment, amusement and affective impact. The above is based on the human capacity to learn by observation, but without own experience.

This implies that a large part of the knowledge that a person acquires throughout his life is not obtained through direct experience, but through the stories he hears, observes, and internalizes. This approach leads to think about the substitution of lived experience and is being widely used in video games. They base their functioning on the mechanism of narrative transport, in the sense that transporting oneself to these experiences involves the subjects both cognitively and emotionally.

Therefore, Wendorf's [45] opinion about the great help that the linking of persuasion theories can mean is relevant. Examples include Petty and Cacioppo's [46].

Elaboration Probability Model or Ajzen and Fishbein's [47]. Theory of Reasoned Action. Likewise, psycho-social models that explain the impact of attitudes on behavioral intention are also good theoretical references. This linkage is so promising that the application of edutainment could be extended to a distant field such as health communication [41].

Entertainment-education-based strategies include messages that are attractive to their audiences, have a strong emotional component and a clear narrative structure, and tend to engage audiences, just like any other commercial entertainment content [44, 48]. From them derives the potential for their use in health communication strategies as well as in education in general.

Slater and Rouner [44], Moyer [48], Igartua [41] and Wendorf [45] converge that motivation and the emotional component are relevant in narrative persuasion. In the opinion of Kreuter et al. [49] narrative persuasion should involve creating coherent stories that should have an identifiable structure in terms of beginning, middle, and end. It should also provide information about a scene, a character, and a particular conflict or situation, raising questions or conflicts and providing the elements that lead subjects to find or construct the solution (p. 778).

However, Moyer-Gusé [48] proposes that for this to happen there must be a kind of balance between fantasy and plausibility. Although narrative persuasion creates a *scene about the scene* (and thereby suspends the enactment of reality), he argues that the scenario presented must be credible and to some extent plausible within existing schemas. This leads to the narrative becoming attractive and thus obtaining the qualitative value that favors the adoption of changes in attitudes and beliefs. This makes it necessary to insist that narrative persuasion bases its effectiveness on the capacity of transportation and identification. This is because, for example, identification reduces counterargument, resistance, fear, and inertia.

According to Green and Brock [50], transportation into a narrative world is a mental process that involves a convergence of attention, imagery, and feelings. This notion of being absorbed in the story is what distinguishes narrative processing from overtly persuasive messages [48]. Slater and Rouner's [44] conducted work with the extended elaborative likelihood model (EELM) and found that:

> *...absorption in the narrative can more deeply motivate a different kind of processing and can lead viewers to adopt attitudes and behaviors promoted in the narrative, while reducing the resistance that can occur when viewers are exposed to overtly persuasive messages (p. 187).*

Igartua and Muñiz [51] conceptualizes the identification with the characters as a mechanism through which the narrative is experienced from within, because an empathic relationship with the protagonists of the narrative is produced. According to Wendorf [45] identification in Extended Elaboration occurs primarily with a key character. It is not imitation and has four distinct dimensions: shared feelings (empathy), shared cognitions (cognition), shared goals (motivation), and absorption (transportation). Through identification with a key character, individuals can enact responses and choices to situations from a position of suspended ideology. Identification with characters is associated with greater cognitive elaboration and developing a reflective process of higher quality or complexity during the viewing of a dramatic feature film among other content [51].

Subjects, identifying with the character, respond from the role to their role, suspending their own thoughts. Transportation is the complete absorption by the narrative of an audience member and allows individuals to temporarily lose themselves. Green and Brock [50] also assume it as a convergent process, but of all mental systems and capacities focus on the events that occur in the narratives.

Wendorf [45] proposes that those involved in narrative persuasion are better able to understand the other's position through distancing themselves. In addition to temporarily losing access to reality, the possibilities for introspection in the choice of roles and the lived experience of those assigned or chosen are increased. According to Wendorf [45], equally important is the homophily or belief that one possesses information, emotions, or cognitions with the character. This experience places subjects in a position of greater susceptibility to attitude changes presented in persuasive narrative content [44].

Other essential concepts are parasocial interaction, originally coined by Horton and Wohl in [52] with the aim of referring to the chimera of reciprocal interaction that audience members felt toward media figures, especially, television at that time. Through such interactions viewers have the feeling that they know the characters or develop the same vicarious type of friendship relationships. This leads them to care about the characters when they go through difficult/compromising situations or to rejoice and express positive emotions at their successes [53].

There are studies that evaluate the role played by parasocial interaction and narrative participation in attitude change. There are also evaluations on the probability of viewer elaboration, attitude change and the probability of behavioral change, among other topics [54–56].

Another intervening factor is the concept of perceived self-efficacy, defined as confidence in one's own ability to achieve the intended outcomes in a given situation [57, 58]. Self-efficacy is considered one of the most important predictors of behavior change in society. In fact, empirical studies explain it as a moderating factor. Van't Riet et al. [59] have also suggested the positive role of self-efficacy in persuasion but including a protective factor (Motivation Theory (PMT) and the Extended Parallel Process Model (EPPM). For Rogers [60], individuals with higher self-efficacy are more likely to accept persuasive narratives than those with lower self-efficacy, who may react defensively, either by ignoring the message or rationalizing negatively.

Worchel and Brehm [61] and Brehm and Brehm [62] propose from this defensive presupposition the psychological reactance theory (PRT). It argues that, when perceived freedom is removed or the individual feels threatened by external factors, he or she will be motivated to restore that freedom. The authors explained that this restoration of freedom refers to restoring individuals' sense of autonomy and self-determination. Subsequent studies have indicated that individuals of higher self-efficacy tend to be more deeply engaged in processing because they are more confident in the recommended behavior and are more motivated to evaluate the advantages and disadvantages of carrying out the recommended behavior.

The structural elements of persuasive storytelling described in the previous paragraphs configure a framework reference for social transformation processes. Therefore, it becomes another framework, this time of converging vectors. Those come together in the commitment to the construction of innovative educational perspectives. In turn, this construction could be display from games platforms, either from gamification used as a learning tool without narrative theoretical foundations or from serious games with the mediation of communication as a fundamental element.

7. Conclusions and discussion

The incorporation of digital games in educational institutions facilitates new ways of accessing, generating, and transmitting information and knowledge. This allows to make flexible, transform, extend and, ultimately, to seek new perspectives of the educational act. Specifically, the effective linking of digital games makes the temporal and spatial contexts more flexible and, along with the interaction and reception of information, among other aspects.

This incorporation also delocalizes knowledge and generates interaction with different types of codes and symbolic systems. At the same time, it leads to the choice of the formative itinerary and of strategies and techniques for training and technological

convergence. Likewise, it favors access to information and its different sources and, of course, flexibility in terms of the roles of the teacher and his or her figure.

The above conclusion is consistent with Eftimova et al. [63]:

> *"The arrival of the new learning methodologies is in response to the reality: new generations should learn in a different way. The so-called "Millennials" are looking for another kind of stimulus. Discussions for modernizing the curriculum include various solutions to retain students' attention and, in order to ensure that teachers learn how to act with a critical attitude, they will be confident and with the developed creative skills that they will need for success in the professional world in the future" (p. 21).*

The review of the different ways of approaching games makes it possible to distinguish between games for learning and serious games. The main differences between them are circumscribed in the management of motivation and fun in the games. Learning games are based on motivation and fun to facilitate educational processes. Serious games, on the other hand, require a particular theoretical foundation on which their structure is built and do not depend on fun, since motivation is handled from theories of persuasion.

Regarding its effectiveness, authors such as Bolyle and Connolly [64], Connolly et al. [12] stated that, despite the increased popularity of game-based learning, there is a lack of empirical evidence to support its validity. However, current scientific research has shown otherwise. The theoretical review found that there are many papers with game platforms that demonstrate the effectiveness of games. Caserman et al. [65] investigated the effectiveness of games based on the following criteria:

Focus on the characterizing goal, clear goals, indispensability of the characterizing goal, correctness of the domain expert content, appropriate feedback on progress, appropriate rewards, proof of effectiveness & sustainable effects, awards, and ratings.

Caserman's results showed that:

> *The effectiveness of serious games should be proven in scientific studies or by winning game awards. Second, high-quality serious games should be fun and enjoyable. They must ensure player engagement and should keep the players in flow (ability vs skills). Finally, the double mission of serious games, that is, the balance between the serious and the game part, must be ensured. Therefore, high-quality serious games should embed the characterizing goal into the gameplay, so that engaging in the serious part is mandatory for playing the game. Furthermore, the interaction technology should be suitable for the target group and game purpose. (2020, p. 10).*

According to the above, the discussion does not focus on the effectiveness of games to facilitate learning (gamification) and social change (serious games); what is relevant in this regard is their design, set-up, and structure to achieve their intended objectives, as described by several authors [5–8, 66, 67].

There are many challenges for researchers in the field, including the application of effective evaluation instruments and the rigorous analysis of the results of the application of games. In this sense, it is of great relevance that game design should be based on scientific research, so that valid and reliable results can be obtained. However, it is important to note that to the extent that serious games and gamification allow participants to learn by doing, they are in line with technological advances and in this sense contribute innovative aspects to education.

Author details

Cirit Mateus De Oro[1,2*], Daladier Jabba Molinares[2], Ana María Erazo Coronado[3] and Rodrigo M. Campis Carrillo[1]

1 Universidad Metropolitana, Minciencias and Uninorte Scholar, Barranquilla, Colombia

2 Universidad del Norte, Barranquilla, Colombia

3 Universidad Metropolitana, Barranquilla, Colombia

*Address all correspondence to: ciritmateus@unimetro.edu.co

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Towards a Theory of Education for Social Change: Exploring the Nexus between Transformational Education and the Capability Approach

Sunday Paul C. Onwuegbuchulam

Abstract

Education generally is geared towards training the mind and getting the learner to acquire skills and knowledge needed in different sectors in society. However, if we agree that education is a public good, there is need to go beyond its conceptualisation from a utilitarian perspective of being instrumental to society's economic progress to an understanding of education as instrumental to realising individual's transformative capabilities and subsequently, social change. Education aimed at achieving social change should focus on not only subjecting learners to cognitive aspects but also getting them to be capacitated to become agents of social change and progress. Exploring this theme and theorising on some mechanics of realising education for social change is the focus of this article. The article adopts qualitative desktop method and utilises secondary data to theorise on realising education for social change, with a consideration of the nexus between two frameworks: Transformative Learning and the Capability Approach frameworks.

Keywords: education, higher education, social change, transformational learning, capability approach, values

1. Introduction

Generally, education is geared towards training the mind and getting the learner to acquire skills and knowledge needed in different sectors in society. According to the UNESCO [1] report on education, education is at the core of societies' effort to adapt to change and to transform from within. The centrality of education and its need in society are also acknowledged in the idea of education (in this case higher education) as a common or public good. Notably, the discourse on higher education as common/public good as can be garnered from some scholars ([2–5], etc.) has led to a conclusion that higher education can be conceptualised as a public good since it helps empower citizens to be economically efficient (amongst other utilities).

It can be inferred that the discourse on higher education as common good has been enshrouded in the utilitarian conceptualisation which understands development as economic growth and all aspects of society including education geared towards realising this. Consequently, higher education curriculum in most contemporary societies has focused mainly on learning that enhances the intellectual/cognitive faculties of individuals in society [6, 7].

However, if we agree that education is a public good, there is need to go beyond its conceptualisation from a utilitarian perspective of being instrumental to economic progress of society, to an understanding of education as instrumental to realising individual's transformative capabilities and subsequently, social change. On this, Chakraborty et al. ([8], p. 1) are of the view that 'education plays a very important role in moulding the character of an individual …Education can initiate social change by bringing about changes in the outlook and attitude of people'. Notably, contemporary societies are faced with lots of issues which need to be addressed. These issues have been exacerbated by the fact that societies are rapidly industrialising and urbanising, necessitating a simultaneous change in human intellect to adapt to the changes in society [1, 8]. The rapidly changing society has also seen the rise in different social ills and is becoming increasingly morally bankrupt, as people lose their capacity to function as moral agents, who are supposed to be at the helm of realising a positively transformed society. Agreeably, every society needs individuals capacitated through education to fulfil a role in the economic sector and work environment, but they also must be equipped to be agents of social change through their ability to exude proper values, morality and ethics. As it stands it will seem that current forms of education are 'totally mechanized. It develops the cramming power of the students but curbs the individual thinking capability of the students' ([8], p. 1). But we are living in an ever-changing world hence 'education must also change … this means moving beyond literacy and numeracy, to focus on learning environments and on new approaches to learning for greater justice, social equity and global solidarity' ([1], p. 3).

Hence, education aimed at achieving social change should focus on not only subjecting learners to cognitive aspects but also to get them to engage in other aspects of learning which can capacitate them to become agents of social change and progress. Exploring this theme and theorising on some mechanics of realising education for social change is the focus of this article. The article adopts qualitative desktop method and utilises secondary data to explore the nexus between two frameworks: Transformative Learning (TLF) and the Capability Approach frameworks (CA). The consideration is based on the premise that there may be a link between the understanding of the different components of the TLF and the CA in theorising about education for social change.

2. Theoretical/conceptual frameworks

2.1 Transformative learning framework

The TLF was proposed by Jack Mezirow in the late 1970s as a theory of adult learning. The framework defines how individuals develop by critically reflecting on their experiences and reconsidering previously held belief systems. This process overtime is geared towards changing the person's flawed perspectives of the world. For Mezirow ([9], p. 22), transformative learning is aimed at transforming 'problematic frames of reference to make them more inclusive, discriminating, reflective, open,

and emotionally able to change'. Hence, transformative learning is about transforming individual's worldviews and understanding how and what leads to this transformation in worldview. In order words, transformative learning summarily is an educational framework which involves the development of an individual's consciousness achieved by transforming the person's worldview and belief systems. It is education centring on expanding individuals' varied capacities through deliberate processes aimed at getting the learner to access symbolic contacts in the subconscious and to critically interrogate fundamental premises on which previously held beliefs are grounded on [10]. Also, central to the TLF is the position that individuals modify their frames of references through engaging in critical reflection 'on their experiences, which in turn leads to a perspective transformation' ([11], p. 167). Furthermore, according to Mezirow, the process through which an individual's worldview is transformed (perspective transformation) follows through three dimensions including: psychological (transformation in thought), convictional (reconsideration of belief systems) and behavioural (transformation in lifestyle) (in [12]). Perspective transformation resulting in transformative learning is infrequent and usually is consequent on 'disorienting dilemma'. This is elicited by some major life crisis or consequent on build-up of transformations in meaning schemes of the individual over a period. Disorienting dilemmas can also occur in a learning context when educators provide space for learners to engage in new forms of critical thought.

Consequently, it can be inferred that there are some important concepts and components in the TLF. Centrally, 'meaning structures' (perspectives and schemes) are main components of the TLF. 'Meaning perspectives are defined as 'broad sets of predispositions resulting from psychocultural assumptions which determine the horizons of our expectations' [11]. Also, 'A meaning scheme is "the constellation of concept, belief, judgment, and feelings which shapes a particular interpretation' ([13], p. 223). Moreover, the concept of critical reflection is important to the TLF—it 'involves a critique of assumptions to determine whether the belief, often acquired through cultural assimilation in childhood, remains functional for us as adults' [11]. In critical reflection, the learner ponders on the ramifications of the problem and through it understands him/herself better.

Summarily, Mezirow sees transformative learning as the core of adult education pedagogy, in that education is aimed at enabling the individual to be an independent thinker. This is achieved through forms of education aimed at assisting the learner to 'negotiate his or her own values, meanings, and purpose rather than uncritically acting on those of others' ([14], p. 11). Transformative learning in the education setting translates to assisting learners to change their meaning schemes. In this, there is a rational interrogation of previously held assumptions and beliefs, 'it is within the arena of rational discourse that experience, and critical reflection are played out' ([15], p. 11). This is to say that through a rational discourse process, critical reflection develops in which experience and assumptions are interrogated resulting in the transformation of meaning schemes and structures. Hence the process of transformative learning 'is essentially rational and analytical' [14]). This view has resulted in some criticism of the transformative learning theory as being intellectual/rationally focused [16, 17].

As part of the effort to provide alternative viewpoint, some scholars have expanded on the TLF. Of note are the views of Robert Boyd and Paulo Freire. Transformation in Boyd's perspective is 'a fundamental change in one's personality involving conjointly the resolution of a personal dilemma and the expansion of consciousness resulting in greater personality integration' ([18], p. 459). Boyd's conception of transformative

education differs from Mezirow's understanding to the effect that unlike Mezirow's focus on rational conflicts, Boyd looks at the arising and resolution of conflicts in an individual's psyche and how these are transformed. Boyd's point of departure is based on an analytic psychology stance, in this 'instead of becoming more autonomous as Mezirow purports, the individual develops a greater interdependent relationship with and compassion for society' ([15], p. 14). Also, Boyd's understanding of transformative education goes beyond rational to other realms of the learner's life including spirituality. The purpose of transformative education includes aiding the learner to recognise their 'spirit'; 'that abiding within the person is a truth, a knowledge, which is not separate from socio-economic, political, and other cultural influences, but transcends them' ([19], p. 282).

On its own, Freire's philosophy takes as a point of departure the ontological position that human beings should be subjects rather than objects, and as such they are continually self-reflecting and working towards the transformation of their context to become more equitable. Differing from Mezirow's focus on individual transformation, Taylor ([15], p. 16) notes that 'Freire is much more concerned about a social transformation via the unveiling or demythologizing of reality by the oppressed through the awakening of their critical consciousness.' Hence, education does not serve a neutral purpose rather 'it either domesticates by imparting the values of the dominant group so that learners assume things are right the way they are, or liberates, allowing people to critically reflect upon their world and take action to change society towards a more equitable and just vision' ([16], p. 9). Also, just like Mezirow, critical reflection is important in transformational education, but contrastingly Freire understands this as enabling learners to become critically aware of their reality and to work towards their society's transformation. The individual's and society's transformations, according to Freire emancipatory perspective, are interlinked and cannot be separated from each other [15].

Against the above backdrop and together with the understanding of transformational learning as proposed by Mezirow et al., this article adopts the understanding of the framework as 'education that not only transfers knowledge, but also develops whole persons who influence communities and nations' ([20], p. 12). In this article, the views of Boyd and Freire are conjoined and allow us to see that education for social change should include efforts to transform the individual in a holistic way and to capacitate him/her to contribute to society's transformation.

2.2 Capability approach

The capability approach (CA) proposed by Amartyr Sen and Martha Nussbaum is a theory of development which recommends the move away from utilitarian/economic conception to an understanding of development that considers human development and well-being. It comprises two normative arguments which are: firstly, that people's freedom to achieve well-being is and should be of primary moral importance and secondly 'freedom to achieve wellbeing is to be understood in terms of people's capabilities which is their real opportunities to do and be what they have reason to value' [21]. According to the CA framework, freedom to achieve well-being concerns what people are able to do and be (functioning) which have consequence to the life they are able to lead. Essential to CA is a set of fundamental human capabilities which are important towards realising well-being and the good life. Also, according to the framework, social arrangements put in place to realise well-being should be based on the extent they help people to achieve functioning they value [22].

The CA comprises some ideas which are core concepts on which the framework is based, they include: Capability, Freedom, Functioning, Value and Agency. Capability refers to the different combinations of functioning, which an individual can achieve and from which the individual can choose from [23]. Freedom according to Sen ([24], p. 31) is taken to mean 'the real opportunity that we have to accomplish what we value.' Functioning is the different things an individual 'may value or have reason to value doing or being' ([25], p. 75). Functioning hence includes different states (beings—being nourished, being housed, being educated, being illiterate, etc.) of human beings and activities (doings—travelling, caring, voting, debating, eating, consuming, etc.) people are able to undertake [21]. On its own 'value' as a qualifier, which always follows the Capability conceptualisations, is not a unique capability approach concept but an essential condition used to evaluate the quality of life [23, 26]. Agency refers to 'someone who acts and brings about change, and whose achievements can be judged in terms of her own values and objectives, whether or not we assess them in terms of an external criterion as well' ([25], p. 19).

This article adopts the CA in its theorisation of education for social change in conjunction with the TLF. Important for this paper is the consideration of education as necessary towards enhancing individual capabilities and functioning. This should consider all aspects of learning that could be termed transformative and which grounds the life an individual would want to lead and which can impact on society's transformation.

2.3 Education for social change

Chakraborty et al. ([8], p. 1) defines social change as 'an alteration in the social order of a society.' Social change may hence constitute a positive and or negative modification in established *modus vivendi* of societies. In most instances though, the discourse on social change focuses on how societies adapt to increasing changes in its varied spaces. For example, increasing industrialisation, urbanisation and changes in human knowledge has notably necessitated that society transforms towards adapting to these changes. Chakraborty et al. ([8], p. 2) are also of the view that 'change means accepting new ideas leading to evolution and development.' This arguably could be geared towards moving society towards a positive response to perhaps a previously negative status quo. For Bhat ([27], p. 2), 'the term social change is used to indicate the changes that take place in human interactions and interrelations. Society is a web of social relationships and hence social change means change in the system of social relationships'. This changes the focus of the concept of social change from the macro society level of analysis to the individual level, focusing on how system of social relationships helps in realising society's transformation. This agrees with the view of Sharma and Monteiro ([28], p. 72) who understand social change as leading 'to transformation in thinking which in turn influences behaviour patterns in society. Social change is an alteration in the thought processes of individuals that drives social progress.' This conceptualisation obviously points to the utility of education as the engine of social change.

According to Chakraborty et al. ([8], p. 1) 'Education is the fundamental method of social progress and reform. It guides the children towards new values and assists the development of intelligence and increase the society potential for its own transformation.' For Sharma and Monteiro ([28], p. 72) 'education is the vital link that brings about social change and generates synergies to address the interconnectedness between sustainability, society and the environment. Education empowers society to

assume responsibility for sustainable living.' These assertions help us to understand the real meaning of education for social change. It is understood that education is the engine of social progress and transformation—through education individuals are brought to understand their place in society and to acquire new ideals towards society's progress and transformation. This needs the individual both child and adult to engage in learning that not only increases knowledge, but also education that helps the individual to become credible members of society. As such, education plays and should play a very crucial role in an individual's character formation enabling him/her to help in realising society's transformation and social change [8].

Bhat ([27], p. 19) notes that 'the role of education as an agent or instrument of a social change and social development is widely recognized nowadays'. Education is as such understood as central to realising social transformation and change; 'education is the root cause of social and cultural changes that takes place within the society' ([8], p. 1). For Desjardins ([29], p. 239), 'educational systems contain both transformative and reproductive elements.' Through these systems, education is envisaged to play a crucial role towards both individual and social transformation. Education for social transformation then brings into limelight the need for the learner to improve him/herself through education and to use such improved capacity to become agents of social transformation. This vision hinges on how the individual views him/herself and his/her role as agency in society's transformation.

Thus, realising education for society's transformation is hinged on understanding the link between the need and freedom for the individual to achieve capabilities and perspective transformation. This, according to Sharma and Monteiro ([28], p. 72), 'implies that educational processes and systems can transform perspectives and behaviour patterns, which in turn inculcates sustainable practices in all aspects of human life.' Education as such is aimed at changing people's behavioural patterns and worldview through curriculum which enhances individual freedom to achieve those different aspects of beings and doings, they have reason to value. This arguably speaks to the nexus between the Capability Approach and the Transformative Learning Framework.

3. Education for social change: Nexus between TLF and the CA

3.1 Placing the human being at the centre of concern

It can be argued that the TLF agrees with the CA with regard to the understanding of human beings as placed at the centre of society's development debate. Notably, Paulo Freire understands education as aimed at the transformation of the human person conceived as a subject not as an object. In this the human person is seen as an end and not a means to an end (to use Kant's words), and as such could become agents of society's transformation having been equipped to do so through education that awakens the individual's critical consciousness. Freire's views could be better explained using Sartre's [30] contrast between the being-itself (objects) and being-for-itself (humans). As a subject and end itself the human subject who engages in learning is treated as being-for-itself who according Sartre is not full of itself (like being-in-itself). This being-for-itself is open to learning towards transforming the mind and consciousness. Education in this sense is understood as helping the subject towards reaching his/her full potential, and there is no limit since being-for-itself must *actuate* his own being.

The above could be linked to the CA which jettisons utilitarian economic conception of development to a focus on individual well-being. In the CA, individual well-being and human development are the focus; the CA 'concentrates on the capability expansion of each person (individual or group) according to their values' ([31], p. 376). Alkire and Deneulin ([32], p. 16) also note that 'to some, the idea that people should come first in social and economic processes appears a redundant truism. But development has long been sought and assessed in economic terms, with a particular focus on the annual growth of income per capita, instead of the consequences of this growth on the quality of people's lives.' It can be surmised that the objectification of human beings could be very much obtainable in a utilitarian system, whose focus is realising economic wealth. In these human beings become secondary and hence could be considered as means towards realising the ultimate end which is economic progress. The CA on its own takes improving the beings and doings of the individual as the priority and the effort is to put in policies and social arrangements to realise this [32]. It is here that the CA focus on individual well-being agrees with the view of TLF according to Freire that human beings should be subjects and not objects.

Hoffman ([33], p. 1) notes that 'the way we view education is challenged by the paradigm shift towards viewing development in less economic terms. The human being is placed at the centre of concerns, and sustainable and human development is presented in terms of enlarging people's choices'. Placing the human being at the centre of concern is important in realising education for social change. The role of education is seen as transformative and geared towards enabling the human subject to expand freedoms to achieve various valuable functioning. From both the perspectives of TLF and CA, the goal of education is to transform and realise the well-being of the individual as a human person. Education as such is geared towards bringing the individual to a greater level of well-being and to equip him/her with the necessary skills and habits to be able to act properly and to help in society's positive change. In this, as conceived by Freire [34], the individual should not be subjected to a form of *banking* education (an instrument of oppression), rather he/she is a subject with a mind who can be engaged in a dialogical education process towards achieving learning. This form of learning does not only help in transforming the person's perspectives and frames of reference (thereby improving beings) but helps the person to become a well-informed member of society, who acts in such a way that he/she also considers other members of society as subjects and not objects. However, to realise this there should be a complementary focus on improving educational structures in society that enable transformative learning [35]; there should be a systemic change of educational culture and to make it focus on realising people's potentials, considering the link between social, economic and environmental well-being factors ([28], p. 17).

3.2 TLF and CA views on education towards social change

Central to Mezirow's TLF is the position that individuals modify their frames of references by engaging in critical reflection and interrogation of previously held assumptions and beliefs. The process of transformation of individual worldview (perspective transformation) is achieved when there is change in thought, belief systems and lifestyle of the individual. In this explication, one can find another link between the TLF and the CA on education. It can be surmised that the transformation in the individual's frame of reference through learning allows the individual the freedom to go beyond possible limiting circumstances to pursue and achieve capabilities and the lives they have reason to value. The process of transformation of the mind through

education could be then interpreted as a process of expanding capabilities. Hence for Sen and Nussbaum, education constitutes a basic initial capacity which is instrumental to realising well-being, capabilities and the lives individuals have reason to value [6, 36, 37]. Scheimer ([38], p. 172) also affirms this and further is of the view that 'If implemented successfully, education can thus contribute to reaching well-being and quality of life.'

Moreover, in explicating CA's view on education, Hoffman ([33], p. 1) notes that 'the role of education as regards the Capability Approach is multiple and complex... education is referred to as foundational to other capabilities. However,...one can also argue that learning that stops at the level of providing only basic reading and writing skills would be insufficient to advance sustainable development.' From this assertion, we can infer another possible link between the CA and the TLF view on education. Here education is understood as the fulcrum on which other capabilities hinge. As already noted, for Sen [24], education is a basic capability—it is an aspect of the major being and doings central to realising individual well-being. Education is not seen here only as a way of getting the individual to read and write but as a way of helping them to expand their capabilities. This is also the aim of transformational education in the sense that the focus is on getting the individual to engage in critical reflection towards perspective transformation [14, 39]. This transformation is deeper than being able to read and write, it points to an understanding that education has a deeper utility which centres on the transformation of the individual's whole being. The transformation is also about realising emancipation of individuals and collectives through education understood as conscientisation and as enabling people's freedom to achieved capabilities ([29], p. 239). Hence, Hoffman ([33], p. 1) assert that 'In order to fully expand the substantive freedom of people to live the life they value and to enhance their real choices, education can and should be more than only foundational to other capabilities.'

Furthermore, O'Sullivan et al. ([40], p. 3) understand transformative learning as involving 'experiencing a deep, structural shift in the basic premises of thought, feelings, and actions. It is a shift of consciousness that dramatically and permanently alters our way of being in the world.' It can then be surmised that individual's transformation as proposed by TLF could lead to the CA understanding of functioning as being. In this education that seeks to get the individual to change frames of references is seen as helping the individual to assume a transformed state of being in which a previously incapacitating state is improved through education. This is substantiated by the understanding of the TLF that learning is and should be geared towards a shift in consciousness and towards realising an enduring alteration of individual's way of being and worldview. According to Boyd's perspective 'transformation is a fundamental change in one's personality involving conjointly the resolution of a personal dilemma and the expansion of consciousness resulting in greater personality integration ([18], p. 459). From this assertion, we can also infer a possible link between the TLF and the CA - a change in one's personality involving the resolution of the individual's quandary (thus expanding the person's consciousness) could be construed as enhancing an individuals' functioning. Notably, the resolution of personal dilemmas and expanding consciousness should lead to greater personality integration. This is functioning as construed by Nussbaum (2000 cited in [41]) who is of the view that functioning is at the centre of fully human life. Relatedly, it can be noted that transformative learning focuses on the transformation of individual's worldviews. Transformative learning as such 'aims at developing a holistic worldview and deep realisation and coherence of the purpose, direction, values, choices and actions of

one's life' ([7], p. 180). This includes the transformation of the conception of how an individual understands his/her being in the world and the understanding of the fundamentals of his/her well-being.

Summarily, transformative learning which hugely promotes critical reflection of previously held assumptions and interpretations promotes transformative capability. Transformative capability denotes the capacity of the individual to learn, innovate and engender apposite change [6]. Transforming an individual's worldview becomes enhancing functioning when we consider that according to the TLF 'Learning focuses around understanding the connections between humans, nature, society and the economy with an aim to develop solutions for our sustainability challenges and making a sustainable world real while learning' ([7], p. 180). When this happens, we can understand that there is a substantial change in the functioning (doings but more so beings) of the individual. In this sense, education is holistic and not only enhances the capabilities of the individual but also the freedom to achieve various valuable functioning in society. 'The individual becomes aware of her role in society and how her actions (or lack of action) perpetuate the current social order. Understanding the role that the individual has in the social fibre, is key to igniting the change' ([42], p. 24). For Schugurensky ([35], p. 63) 'transformative learning is really transformative when critical reflection and social action are part of the same process.'

As noted by Chakraborty et al. [8], education is central to social change and social progress and reform as it guides individuals towards new standards and helps in the development of intelligence needed to increase society's potential to transform. Thus, enhancing people's capabilities through education is and should be ultimately aimed at society's transformation and social change. Here also the aim is not only in transforming individual experiences but enhancing transformation of social structures, institutions and social relationships [27]. This can only be possible when education adopts a multidimensional and interdisciplinary approach [33, 42]. It actually demands a re-imagination of the educational process 'so that learners could experience humanness, autonomous thinking and genuine transformation from inside out as ably suggested by Mezirow in his transformative learning for adults' ([43], p. 17). This is where the TLF also agrees with the CA understanding of education—education is conceptualised by the CA to consider the relationship between teaching, learning and human development [33]. This notably relates to the TLF aim to achieve perspective transformation through a teaching and learning process aimed at critical reflection, perspective transformation and human development. In this, learning is not only seen as focusing on cognitive elements but goes beyond this to consider other approaches aimed at enhancing individual's substantive freedom to achieve capabilities. Only when this becomes a reality that the individual could be said to have been equipped through education to contribute towards the progress of society.

3.3 TLF and CA views on 'values' and education for social change

According to Poolman ([31], p. 320), 'the CA has been hailed for successfully reintegrating values and beliefs into development...so that people can define their own flourishing.' The need to realise individual's values or 'the life an individual has reason to value' is another point in which the TLF and the CA framework dovetails. It is argued that transformative learning is aimed at helping an individual to realise the life he/she has reason to value. Mezirow ([14], p. 11) agrees that transformative education is geared towards enabling the individual 'negotiate his or her own values, meanings, and purpose rather than uncritically acting on those of others.' This aim of

transformative learning can be related to the CA focus on evaluating well-being and development policies based on the life which an individual has reason to value. On this, Walker [44] rightly notes that the capability concept 'reason to value' is crucial since it focuses attention on individual's considered and informed choices. The life which an individual has reason to value is hence at the core of the CA and is a condition that must be met for there to be a true enhancement of the functioning of the individual in society. As such, the 'freedom to achieve well-being is to be understood in terms of people's capabilities, that is, their real opportunities to do and be what they have reason to value' [21]. This can be achieved through transformational learning process which could help in the negotiation of individual's value systems, meanings and purposes. As such education should be aimed at equipping people with not only knowledge and skills but values necessary for sustainable human development and living a capable, confident, healthy and productive life in accord with nature and social values [45].

The ability of an individual to exercise freedom is facilitated by values which themselves are influenced by public and social discussions and exchanges [25, 38]. For Sherman ([36], p. 10), 'value, from the CA perspective, is primarily concerned with advancement of the human condition. To live a life of value, or a life that one has reason to value, opportunities or substantive freedoms must be secured for individuals that allow them to make reflective and informed choices.' This is where the TLF's views becomes relevant, in that through the effort to engage the individual in critical reflection, there can develop the ability of the individual to make informed choices. It is envisaged that the individual comes to realise the real opportunities to negotiate values, meanings and purposes as proposed by the TLF. Simsek ([46], p. 201) agree that transformative learning 'is the kind of learning that results in a fundamental change in our worldview as a consequence of shifting from mindless or unquestioning acceptance of available information to reflective and conscious learning experiences that bring about true emancipation.' Bringing about true emancipation could be interpreted in CA's perspective which focuses on the effort to realise individual's functioning, well-being and the life he/she has reason to value [29].

Furthermore, according to Mezirow ([14], p. 11), 'Transformative learning in the education setting translates to assisting learners to change their meaning schemes (beliefs, attitudes, and emotional responses) through education.' This assertion allows us to understand that perhaps contrary to criticism of the TLF framework as being only intellectual focused [17], the framework encompasses aspects which help in the effort to realise true functioning and the life an individual has reason to value, by the incorporation of the emotional and affective aspects of learning. This is achieved through the process of reviewing old assumptions and ways of understanding experience through critical reflection [6]. This could mean helping the individual through a transformative learning process to improve his/her value systems—empowering 'individuals to change their perspectives and habit of minds (understanding of what is "right" or "wrong")' ([47], p. 64). Also, through this educational process the individual's meaning schemes are transformed leading to well-being, capability enhancement and subsequently social change. Hence, Sharma and Monteiro ([28], p. 72) is of the view that 'to address the challenges faced by global communities, educational systems can transform values, attitudes and behaviour patterns to actuate social change.'

Negotiating learner's values, meanings and purposes as envisioned by the TLF translates to engaging in education aimed at a change in the meaning perspectives

of the learner. It should be noted that 'education is a major instrument in initiating social adaptation by bringing about a change in outlook and attitude of man. It can bring about a change in the pattern of social relationships and thereby...cause social changes' ([28], p. 72). This can be achieved through a conscious effort to design education curriculum that balances between knowledge acquisition and the formation of values, attitudes and patterns of social relationships. As noted by Laininen ([7], p. 180), 'In a rapidly changing world, the role of the curriculum must also be reconsidered. Instead of its common use as a collection of often outdated knowledge, it should be a tool for organising learning opportunities in which education, learning and the latest scientific knowledge converge around making real-life changes in the environment and society.'

Aristotle understands education's principal mission as geared towards the production of good and virtuous citizens for the city state. Quality transformative education activates human development and formation of learner's character building it up to be of value to society—it ignites inner transformation enabling the individual to acquire skills necessary for social responsibility ([43], p. 14). Allowing the learner space and time or putting in place a learning environment through which he/she can engage in learning about social responsibility, ethical, religious, spiritual and emotional elements is important. It is through this that education becomes transformative and can play a central role towards social change. The learner can become a true agent of social change when he/she has been equipped through a transformative learning process to engage extra-curricular and extra-cognitive elements towards a behavioural change. Herlo ([6], p. 118) affirms that 'Transformative capability involves creating an educational focus, beyond an emphasis solely on knowledge and understanding, towards competence, using methodologies that engage the whole-person and transformative approaches to learning.' According to Sharma and Monteiro ([28], p. 72) 'education is a process which brings about behavioural changes in society, which enables every individual to effectively participate in the activities of society and to make positive contribution to the progress of society.' In this light, Dewey envisages that through education individual's become the best possible human beings and equipping 'young people with the skills to shape their own morals' ([42], p. 19). It is here that the vision of the CA on the role of education as helping to enhance individual's capabilities becomes central.

Moreover, it is granted that the process of education is mostly cognitive, but it can also involve encounters that facilitate spiritual and emotional dimensions 'to equip learners with higher order capabilities to respond effectively to complexity, uncertainty and change' ([6], p. 119). For Laininen ([7], p. 181), 'the cognitive competences can be seen as tools by which we can shape the clay of knowledge and create something new out of it. Our values and attitudes determine how we choose our clay and what we will shape from it.... education for a sustainable future must have a strong reflective value dimension included.' Hence, Hoffman ([33], p. 2) is of the view that 'education needs to take into account the inter-relatedness of teaching, learning, and human development.' As such, the role of education to realise enhanced capabilities should include not only the cognitive but other human development aspects—education should thus be integrative, incorporating into cognitive learning, other aspects that can capacitate the individual towards progressive personal change and progressive social change ([40], p. 23). Boyd also notes that transformation involves an essential change in an individual's personality in which there is a resolution of personal dilemma and development of the person's perceptions leading to better personality

integration (in [17]), calling for extra-intellectual sources [48]. This means that the content of education should include those aspects of beings and doings the individual has reason to value which may include acquiring morals, ethics, faith and spirituality. Hence, it is advised that education should be holistic and not only focused on the head ignoring the rest of the aspects of human existence. As such, Miller ([49], p. 97) is of the view that education should include the spiritual perspective;

> *From a spiritual perspective, learning does not just involve the intellect...it includes every aspect of our being including the physical, emotional, aesthetic, and spiritual. These aspects are interconnected; we cannot compartmentalize learning...unless the development of the mind and body goes hand in hand with a corresponding awakening of the soul, the former alone would prove to be a poor lopsided affair.*

O'Sullivan et al. ([40], p. 10) rightly note that 'contemporary education today suffers deeply by its eclipse of the spiritual dimension of our world and universe... in a world economy governed by the profit motive, there is no place for the cultivation and nourishment of the spiritual life.' Consequently, it is the reality that even though there exists more capabilities, choice and freedoms in developed countries than ever before, these countries still experience prolonged and widespread feelings of stress, fatigue, depression and other mental health problems [7, 50]. Laininen ([7], p. 179) further asserts that 'our modern society is also suffering from a vanishing understanding of what makes life meaningful to which the consumer-centred wellbeing paradigm has been unable to provide a solution.' O'Sullivan et al. ([40], p. 24) agree with this and further note that 'all notion of communal life and values and government responsibility outside the support of economic "growth" is fast disappearing.' It can be agreed that to find a sustainable solution to these problems and thus transform society from these maladies, there is role for education that is transformative in nature which considers values. Chakraborty et al. [8] for example agree that protecting, preserving and promoting what the authors call 'eternal values' which are of moral and spiritual nature, is one of the functions of education. Notably, 'values, especially those that concerning defining a meaningful life, cannot be taught directly. Instead, learners should be provided experiences that touch their emotions—and lead them to the springs of their intrinsic values' ([7], p. 182).

Hence as part of the process of capacitating learners, transformative learning envisages considering education as a spiritual venture inculcating in the learner the sense of the sacred which embraces all aspects of the TLF [40]. Perhaps it is here that the role that religion and its networks/affiliates can play in education becomes relevant and needs to be interrogated. Religion and faith-networks are known to encapsulate moral, ethical, spiritual and faith elements which can ignite inner transformation [51], the realisation of behavioural change and the individual's true functioning, well-being, and the life he/she has reason to value. Realising education for social change needs the re-invigoration of spirituality and encouraging students who participate in religious/spiritual extra-curricular activities at higher education campuses. It is then important to assess learner's involvement in extra-curricular and extra-cognitive activities such as attending to issues of faith by going to churches, mosques and other faith groups on campus. The effort will be to understand how these groups, their activities and teachings help learners to achieve transformative education and subsequently realise enhanced functioning and the lives they have reasons to value.

3.4 TLF, agency and education for social change

The CA conceptualises agency as central to realising people's capabilities. Agency is linked to the freedom an individual has to pursue whatever goals or values he/she conceives as important [52]. Agency emphasises on what human beings are able to do in order to realise well-being and as such people 'can be agents of change through both individual action and collective action' ([53], p. 12). Human agency rather than organisational agency is seen as central to realising capabilities—agency is understood in the sense that the individual can be the agent of realising his/her own well-being [22]. But Sen also conceptualises agency as 'someone who acts and brings about change, and whose achievements can be judged in terms of her own values and objectives, whether or not we assess them in terms of some external criteria as well' ([25], p. 19).

To achieve social change, individual capacities need to be enhanced through an education process that helps create engaged citizens [42]. From Mezirow's [14] presentation on the TLF, it can be inferred that the role of the teacher as an agent is to afford learners space to engage in discourse, which also includes helping him/her to assess his/her beliefs, feelings and values [48]. It is the duty of the teacher to put together a pedagogy that allows the creation of engaged citizens, who are capacitated to contribute to society's transformation. Dewey and Freire's understanding of education pedagogy allows us to see the role of the teacher as agency towards enhancing capabilities. For Dewey and Freire, traditional model of education sees the role of the teacher and that of the learner as completely opposite. In this model, the teacher is seen as the authority and a know-it-all, who transmits knowledge to the learner. For Dewey, education is not about a teacher trying to pour knowledge into empty heads of learners—it is 'not an affair of "telling" and being told, but an active and constructive process' (in [42], p. 20). Also as already noted, for Freire [34], the role of the teacher in education is to engage the learner in a dialogical form of education which does not follow the *banking* method that considers the learner as a bucket to be filled up. This agrees with CA understanding of Agency which does not limit the individual freedom to purse his/her proper functioning and well-being. It can be surmised that *banking* education which Freire critics does not allow the individual freedom to pursue his/her enhanced capabilities, functioning and well-being. *Banking* education does not allow perspective transformation by not allowing the individual the opportunity to engage in critical reflection.

The teacher as agency should lead in the effort to realise education for social change. The teacher should be the fulcrum on which the effort to realise learner's enhanced capabilities and transformation hinges. Notably, transformative learning cannot be assured except the teacher affords the learner opportunity to learn transformatively [54]. Sharma and Monteiro ([28], p. 72) agrees that 'educators are responsible for transforming communities and initiating social change.' The role of the educator here is to get the student to freely pursue the education which he/she has reason to value. Bhat ([27], p. 18) notes that 'it is desirable for each individual to have that education which best suits his capacities. The development of such a genuinely educative society calls for the continuous adaptation of our educational institutions to the needs of its members.' Chakraborty et al. ([8], p. 8) also agree that 'education should be imparted according to the own interest of the child. The whole personality of the child is developed physically, intellectually, morally, socially, aesthetically and spiritually. He is recognized in the society.' Realising this means subscribing to

a pedagogy that allows the student independent critical reflection towards perspective transformation. It rather exalts a pedagogy which could be seen as parallel to the Socratic *Elenchus* method of getting the student to engage in critical thinking. The *Elenchus* pedagogy is about dialogue, and according to Cranton [48], transformative learning envisages a pedagogy that encourages dialogue in which both the educator and the learner participate equally in discourse. This translates to the TLF's view of the role of the teacher as that of facilitating the process of critical engagement towards knowledge reconstitution 'and changing of people's thinking and behaviour' ([55], p. 4). Establishing this could help in realising the CA vision that people should be given the freedom to shape their destiny instead of being passive recipients of external agency efforts [56]. Also, this could enable the learner become agents of social change as he/she acquires the capacity to self-transform and to think and work towards social transformation and participate fully in their communities [57]. This is what Laininen ([7], p. 182) understands as 'fostering change agency' in which individuals are nurtured to be able to 'generate change in the different roles or phases of their lives.' Hence, any effort to realise education for social change should take into consideration the role of the teacher as agency and the role of the learner as future agency.

Furthermore, realising transformative education aimed at perspective transformation and enhancing individual's capabilities and well-being towards social change should require the input of other actors besides the role of the teacher in the formal education setup. Notably, in society's varied arena, there is need to assess the efforts of different social forces as agency (in collaboration or in contestation) engaged in projects aimed at individual and society's development [26, 58]. Their role as active agents of course should be assessed in terms of what they are able to do in line with their conception of the good and values [52, 59, 60]. This allows us to further comprehend the agency role of Civil Society Organisations (CSOs), NGOs and Faith-based networks in realising transformative learning towards enhancing learner's capabilities, functioning and social change. Notably, as Sen [25] envisages, the achievements of someone (agent) who acts and brings about transformation can be assessed in terms of the person's values and objectives. Hence, the success of CSOs, NGOs and Faith-based networks in helping to realise education for social change would be based on and assessed in terms of how such agencies' values and objectives help individuals to achieve transformation that can enable them to positively be future agents of society's transformation.

4. Conclusion

According to Sharma and Monteiro ([28], p. 73), 'Transformative learning occurs when individuals change their frames of reference by critically reflecting on their assumptions and beliefs and consciously making and implementing plans that bring about new ways of defining their worlds.' When this happens, it could be said that the individual has acquired the opportunity freedom to pursue and achieve various valuable functioning (doings and beings) as conceptualised by the CA. Perhaps this is the first instance where the views of the TLF and CA on the utility of education are linked. The effort in this article has been to delineate some other notable linkages of the two frameworks towards theorising about and conceptualising education for social change. Education for social change based on the views of the TLF and the CA hence is targeted at helping the learner achieve transformative capabilities, which underscores the capacity of the individual to learn, innovate and engender apposite

change in society. It is education which not only targets the mind and cognitive abilities but the totality of the learner's life considering mental, spiritual, moral and ethical faculties. This form of education leads to well-being and trains the learner to be capable of leading the life they value, which may include becoming themselves agents of social change. This demands agency that is focused on allowing the learner the space and time to engage in critical reflection towards perspective transformation and the realisation of enhanced capabilities and the life an individual has reason to value.

Author details

Sunday Paul C. Onwuegbuchulam
Centre for Gender and Africa Studies, University of the Free State, Bloemfontein, South Africa

*Address all correspondence to: sage1_ugoh@yahoo.com

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Critiquing Playful Project-Based Learning as Pedagogy for Entrepreneurship Education

Adri Du Toit

Abstract

The need to expand entrepreneurship education in learners' schooling is a growing concern globally. It is especially pertinent in countries experiencing high levels of unemployment and ways to expand and improve its implementation is continually sought. Abundant research has been published about preferred pedagogies to enable and foster entrepreneurship education. Amongst these, project-based learning has long been recognized as one of the key teaching-learning strategies to enable meaningful entrepreneurship education. Recently, publications on 'playful' project-based learning as pedagogy for entrepreneurship education have increased notably. Theoretical foundations for this emerging new pedagogy in entrepreneurship education appear to be underprovided. Hence, the theoretical foundations provided by Biesta's three functions of education, namely qualification, socialization and subjectification, were used as an analytical framework to explore what 'good' entrepreneurship education is (or should be) and how the pedagogy of playful project-based learning can bolster it. The chapter contributes to the body of knowledge by expanding insights into theoretical underpinnings for entrepreneurship education, as well as by critiquing playful project-based learning as pedagogical choice for implementing meaningful entrepreneurship education.

Keywords: 21st century skills, competencies, entrepreneurial mindset, life-long learning, meaningful learning, playful problem-based learning

1. Introduction

Youth unemployment is considered a global crisis, with numbers estimated to be between 15% and 18% worldwide [1]. In South Africa, however, youth unemployment reached a shocking 74,7% in the first quarter of 2021, based on the expanded definition for unemployment, which includes the unemployed who have given up finding a job, as well as unemployed persons actively looking for employment [1]. The prospects for young people to find gainful employment after school, even if they are actively looking for employment, therefore seem dismal, especially in South Africa.

Adding to this conundrum, are the constant changes that learners face in everyday life, as well as in preparation for the world of work [2]. These changes are often associated with the requirements of the 21st century, including a focus on knowledge-based

economies, digitization on many levels, changes in the workplace and labor market, an increasing variety of communication modes, multilingualism, environmental and sustainability issues, as well as changes in societal values [2–5], to name but a few. These changes all require that learners develop skills and competencies, as well as different ways of thinking, that will allow them to be more adaptable to change, or to even excel or prosper in changing circumstances. At present, schooling does not prepare learners sufficiently to enable them to flexibly deal with or thrive in changing circumstances [4, 6, 7].

These are two of the main reasons why critics are persistently outspoken about the inadequacies of school education to prepare learners not only for employment, but also for a meaningful life after formal schooling. For example, in an International Monetary Fund study which explored the "causes and consequences of the weak outcomes of South Africa's education system", ([8], p. 13) the researchers found that "South African learners ... exhibit substantial deficits in critical learning skills at early levels of education." In a broader view, a report by the World Bank Group ([9], p. iv) noted "insufficient skills as the key constraint to reduce poverty" in South Africa. Furthermore, when learners perceive and experience what they learn in school as useful, relevant and meaningful, their motivation to learn, and keep on learning, is fostered. Quality, meaningful and well-designed education can reduce skill deficits and can reduce the prevalence and extent of unemployment [8, 9].

Exploring ways to overcome these deficits in schooling might therefore be a good point of departure to better prepare learners for the word of work – whether they find employment of self-directedly create their own employment – as well as to make such learning more meaningful as part of their journey to become self-motivated, life-long learners. To support such an investigation, competencies and skills which learners will require for a meaningful life and gainful employment in the 21st century needed to be considered, as well as suitable learning environments and conducive elements which will foster such skills and competencies in preparation for life-long learning. In addition, against the background of limited employment opportunities available in many countries across the world, as is evident in South Africa, serious consideration needs to be given to prepare learners for self-directedly creating their own employment opportunities, or to develop a positive entrepreneurial mindset as part of their schooling. These concepts, and how they were viewed and woven together in the current study, are discussed next.

2. Literature study

The elements that must be included, or the type of learning envisioned for an improved school education is discussed first, followed by descriptions of how such learning ought to be constructed to be most effectively implemented in practice.

2.1 Elements to include to make schooling more meaningful

Against the background of the problem stated in the introductory section, the literature study revealed that several key elements can make schooling more meaningful to 21st century learners, especially considering the reported skills gaps and high levels of youth unemployment. These elements include the development of 21st century competencies and skills, developing an entrepreneurial mindset, preparation for self-directed employment, and fostering life-long learning.

2.1.1 Competencies and skills required for a meaningful life in the 21st century

Entrepreneurship education have been evolving since its introduction into educational systems over the world. Most recently, a trend deviating from the teaching of "objective facts, theory and business plans" for entrepreneurship education was noted, progressing toward "more innovative learning" using pedagogies aimed at developing entrepreneurial thinking, behavior and competencies [10]. Furthermore, the Entrepreneurial Learning Initiative ([4], p. 4) describes entrepreneurship as "the self-directed pursuit of opportunities to create value for others." The focus for entrepreneurship education has therefore expanded to include particular ways of thinking and the application of certain skills and competencies, in order to develop the learner as an individual functioning in a complex and changing world, as opposed to only teaching them about enterprise development [10, 11]. To attain this, Higgins and Refai [12] propose that learning experiences should be designed to enhance or foster entrepreneurial aspirations, competencies and several skills. Competencies are perceived capabilities, personal attributes or a set of skills and knowledge, developed by an individual through education and experiences [13].

The skills referred to here are labeled by various terms in the literature, such as 'soft skills', 'character strengths', 'employable skills', 'entrepreneurship skills', 'deeper learning outcomes', '21st century skills' or 'non-cognitive skills' [2, 3, 6, 10, 13–15]. For the current investigation, these skills were considered as being vital for meaningful living and working in the 21st century, and therefore the collective term '21st century skills' is used. Some of the frequently cited 21st century skills include critical thinking; creative or innovative thinking; enhanced communication; collaboration; self-regulation or self-responsibility; problem-recognition and problem-solving [2, 6, 9, 13–17]. All these skills should be fostered to better prepare learners for life after school, however, the skills needed for identifying and solving problems are crucial to make learning meaningful and connect it to learners' lived experiences [10], as well as to foster learning from mistakes [12, 17], which develops resiliency that learners will need to efficiently adapt to change. Learning should be scaffolded according to processes which will develop learners' way of thinking, as well as their mindsets and which will encourage self-responsibility for or self-directed learning [17], which supports the overall goal of developing life-long learning.

The skills and competencies mentioned here are vital for education, employment and for entrepreneurship, including entrepreneurial thinking or developing a positive entrepreneurial mindset.

2.1.2 Developing an entrepreneurial mindset

The term 'entrepreneurial mindset' is defined and disseminated in various (and sometimes opposing) ways [18]. In the simplest of terms, the Cambridge Dictionary [19] defines a mindset as "a person's way of thinking and their opinions". According to Zappe ([18], p. 5) most definitions for 'entrepreneurial mindset' however include or refer to "a set of characteristics and skills" useful to both entrepreneurs and aspiring entrepreneurs. It therefore makes sense to define an entrepreneurial mindset as utilizing various characteristics (or competencies) and skills to support and develop a particular way of thinking [20]. As an example of such a combined definition, the Kern Entrepreneurial Engineering Network [21] refers to an entrepreneurial mindset as "a collection of mental habits" or ways of thinking that are purposefully applied to create value and positive change. Being able to develop learners' entrepreneurial

mindset would thus increase the value of their schooling and should be aspired to [22]. The value it contributes to learning is so great that an entrepreneurial mindset is even referred to as "an essential life skill" [20]. The Entrepreneurial Learning Initiative ([4], p. 3) further notes that the rapidly changing world requires "everyone to think like an entrepreneur", implying that its value benefits learners other than entrepreneurs or aspiring entrepreneurs. In addition, Jha [20] reiterates that an "entrepreneurial mindset can indeed be taught and cultivated, and that it is imperative to do so". The ultimate aim of entrepreneurship education should be to make learners more engaged in their learning, and to enhance their understanding and involvement in entrepreneurship, which results in changes in perception and intrinsic learning [10]. It should also be noted that an entrepreneurial mindset can be related to entrepreneurial activity but that it is also valuable in many other contexts [21]. One such a context, is the world of work and employment – including self-employment or employment by an employer.

2.1.3 Self-directed employment

Education is intended to prepare learners for the world of work, whether it be for employment by others, or self-employment. Entrepreneurship education has been expanding significantly globally specifically with the purpose to encourage and develop more self-employment opportunities [17]. When suitable educational approaches or processes are utilized and applied in entrepreneurship education, its value can, however, be expanded. For example, creating suitable opportunities for learning or using interactive methods will enable learners "to become 'empowered to do', and [contribute to an understanding of] how such behaviors of thinking can be supported and facilitated" ([12], p. 177). An entrepreneurial mindset, which includes ways of thinking and utilizing competencies and skills, is thus essential for preparing learners for a meaningful life but are also vital to prepare learners for the world of work. Since formal employment opportunities are scarce, learners would have to be taught how to utilize the above-mentioned skills and competencies to identify, select and plan opportunities for creating their own employment, as an expression of self-directed learning. Self-directed learning is an essential skill that contributes to and supports the development of life-long learning [23].

2.1.4 Life-long learning

Education and learning should be viewed as a life-long process, rather than a single or intermittent event [4]. Competencies and skills continue to develop throughout a learners' life, through new and prior life experiences in a variety of contexts [15]. Including continuous and purposeful life-long learning as part of the intended learning in a curriculum will therefore contribute to continued development and construction of knowledge, skills and competencies, which adds value and significance to the lives of learners [15]. Hence, knowing how to learn, and how to continue to learn (life-long learning) is a critical future competence [2]. Entrepreneurship education, and the associated learning and mindset, is stated as key competencies for life-long learning [22], further highlighting the interconnectedness of these learning modes.

In addition to the intended learning and focused skills development discussed above, several other elements – which contribute to the planning of quality education and the implementation of the intended learning – should also be considered. These elements all contribute to the learning environment which can foster or hinder

learning effectiveness and include the learner; the teacher; teaching-learning designs; as well as the teaching-learning or pedagogical approach utilized. Suitable consideration and alignment of these aspects will contribute to the development of a learning environment that will be conducive to fostering the type of learning and entrepreneurial mindset envisioned for South African learners.

2.2 Scaffolding or constructing learning environments to foster meaningful learning

Learning is a contextual process in which learners and teachers play the main roles. The strategies, approaches and choices these role players make or implement in the teaching-learning process are further influenced by their beliefs, "pre-assumptions and understandings, shared realities", as well as the context in which the learning takes place ([12], p. 178). These elements should be carefully considered and scaffolded to foster deep and meaningful learning [22]. In the current study, the type of learner, the changing roles of teachers, real-life learning designed for value creation, and suitable pedagogical approaches to sustain meaningful learning, were the key elements focused on.

2.2.1 The type of learner

In traditional instructional modes of teaching, knowledge was 'transmitted' to learners [17, 23, 24], and they played a passive 'receiving' role. However, direct instruction does not involve the learner in the teaching-learning process and does not support as much learning and skills development as active, practical learning strategies [25]. More recent studies emphasize the role of learners as co-constructors of the teaching-learning process and highlight the utilization of learners' personal or 'real-life' experiences to make learning more meaningful and practically applicable [6, 9, 12, 16, 23, 26]. Learners must be taught how to learn and to enjoy the process, as a foundation for their development as self-directed and life-long learners [27]. Including learners in the learning process using real-world connections increases learners' engagement with their learning process and increases their motivation to learn [3].

The real world is, however, not static and continuously changes, impacting learners' learning in various ways; therefore, changes need to be considered part of the learning environment. Changes are complex and happening rapidly; therefore, learners must be prepared to thrive in a world that demands a different approach to learning [2]. One example of change in the learning environment that has significantly impacted learners is the growth in digital and online resources and connectivity, which resulted in a "dependency culture on a range of electronic media… online communication, social media interaction and information searching" ([17], p. 198). Learners are now much more 'digitally demanding' and expect this to be addressed as part of their involvement in their teaching-learning processes [15, 26]. Technology supports skills development and enhances the transferability of skills such as problem-solving, critical thinking and communication to different contexts [27], making the learning more useful and meaningful.

2.2.2 The changing roles of teachers

Changes in the learning environment affecting learners are also affecting teachers, especially in how they approach the teach-learning process. If the development

of a particular way of thinking (mindset) or specific 21st century skills is a priority, teachers cannot be mere instructors but must become active role players – not only as part of the teaching process but also in the learning process [22]. Teachers become guides or facilitators, and mentors in the learning process, moving away from the lecturer/teacher role [17] and become catalysts of learning [11]. Learner-centered teaching-learning approaches require learners to become more self-directed and collaborative in the learning process, but this does not diminish the teacher's critical role in the process. Teachers must carefully plan and scaffold teaching-learning, including feedback as a multi-directional teaching-learning tool, rather than the traditional one-directional teacher-to-learner feedback [3, 10]. Teachers' own prior learning, beliefs and experiences contribute to the teaching-learning process, resulting in a richer learning experience for both learners and teachers [10, 17]. These adaptations contribute to teachers' continuous life-long learning, as they become deeply involved in the learning process and development of skills. Life-long learning is vital for teachers to enable them to adapt to constant changes in the learning environment, such as curriculum adaptations, technological advances, novel pedagogies or changes in societal values [2]. Continued interest and participation in professional development is therefore vital to contribute to teachers' flexibility in adapting to changes [26], which will contribute to improving schooling.

Despite moving toward more skills-based, active and practical learner-centered teaching-learning, teachers still might face challenges regarding which content to teach, especially concerning entrepreneurship education [11]. It is reiterated that a 'one-size-fits-all' approach for implementing the curriculum is seldomly effective, and therefore the various aspects – such as learners' prior knowledge, teachers' experiences, and the context in which learning takes place – must be carefully considered and intertwined to ensure optimal learning for particular group of learners [10, 24]. Learning should therefore not be removed from lived ('real-life') experiences, nor should it be only focused on the individual.

2.2.3 Real-life learning designed for value creation

Learning experiences that are purposely designed to utilize real-life experiences and to create value for others result in "powerful [learning] that develops entrepreneurial self-efficacy, passion, identity and a personal career vision" ([16], p. 943). This type of learning strongly affects learners' passion for learning, motivates them to continue to learn and increases their enjoyment of the learning process [16]. Exploring and understanding how various issues and factors impact learning will provide insights into how learning contexts could be designed to develop teaching and learning processes to meet the needs of learners to a greater extent [3].

Learning should be designed to reflect learners' real-life contexts and experiences, to enable them to apply the knowledge and skills they have learned in their own lives, as well as to the benefit of those in their communities, which in turn intensifies their interest and motivation in the learning [27]. Creating value for others increases learners' engagement in the learning process, as well as the "perceived meaningfulness of schoolwork" ([16], p. 953). To enable holistic education, learners' family and community contexts, together with teachers and other educational role players, should be utilized to form partnerships to support schools as the core teaching-learning environment in any particular community [3]. In addition, opportunities should be created that will allow learners to apply their skills in different contexts and across different subject domains [17, 26] – in other words, learning should be designed to be

transferable across contexts, or to novel situations [3]. Such transferability establishes a bridge between learners' learning and their real-life experiences [28] to make it more functional. This would be especially valuable against the background of the high unemployment in many countries, to support learners when they have to develop entrepreneurial opportunities for self-employment and to foster a "personal career vision" ([16], p. 943) for themselves.

To enable the fostering of the preferred skills and competencies, together with the effective design and integration of all these elements of the teaching-learning process, the definitive consideration should be how teaching-learning should be approached to implement such learning with optimal benefit for the learners. For this, the selected teaching-learning approach or pedagogy would be decisive.

2.2.4 Pedagogical approaches

Different teaching-learning approaches are needed to enable the mindset and ways of thinking that learners will need in a fast-changing world. What is required is a pedagogical approach that is "dynamic, innovative, collaborative and learner-led" with "creativity at its core" ([17], p. 203). In the same vein, Saavedra and Opfer ([27], p. 8) frankly state that "Learning 21st century skills requires 21st century teaching". It is further recommended that approaches are selected that will support active, learner-centered learning-by-doing, based on experiential problem-based learning experiences [3, 4, 10–12, 17, 21, 26].

Experiential learning pedagogies have a notable positive impact on learning [11, 23] through linking learning to the real-world or lived experiences of learners by solving ill-structured problems [12]. Including reflective practice on their experiences contributes to bridging the gap that often exists between theory and practice [16, 24]. Together with self-directed and peer-to-peer learning, this approach engenders learning even in "resource-constrained circumstances where the path is not clear and the rules are not well defined" ([4], p. 23), making learning more "malleable" ([17], p. 202), which contributes to the transferability of learned knowledge and skills [27]. Experiential learning is often used to foster lifelong learning and entrepreneurship education [9, 11, 21].

Problem-based learning is a well-planned and carefully scaffolded process in which skills development is prominent whilst contributing to the personal development of learners [17] as they identify and solve everyday problems [10]. The whole learning process is scaffolded around a central problem that guides and connects the learning and skills development in the process [25]. Project-based learning is also problem-based, utilizing the same scaffolding and processes, and both these approaches are closely aligned to the intended learning associated with entrepreneurship education [14]. Project-based learning shares several principles of problem-based learning. The main difference is that the solution to the problem in project-based learning is in the form of a system, product, or artifact [14]. Using real-world problems from learners' everyday lives to plan and structure their knowledge and skills development will make such learning more meaningful. The physical product or artifact that is produced at the end of the learning process drives and motivates learners to excel in the learning process, since their solution might make an actual positive difference in their own lives, or create value for members of their community, when they solve or ameliorate the stated problem [16]. Projects can span over longer time intervals and be scaffolded to include developing knowledge, skills and competencies in combination with subject content in various disciplines [3].

Project-based learning can therefore contribute to make learning more meaningful and valuable on various levels.

The many benefits associated with project-based learning necessitates that this pedagogical approach must be implemented from an early age to enable the development of the preferred mindset and skills from the onset of formal schooling. Research increasingly indicates play-based learning as a suitable vehicle to make this happen as part of early education. Adding 'play' to 'learning' will also increase learners' enjoyment of the learning process. Especially in early childhood education, play-based learning is described as a context for learning, which helps learners make sense of themselves in relation to their environment, objects around them, and social interactions [25]. Playful project-based learning utilizes active, learner-centered teaching-learning pedagogies using learning-trough-play and project-based learning as scaffolds to link learning to learners' lived experiences and to "better prepare learners to thrive beyond school by deliberately fostering 21st century competencies" ([29], p. 4). Play-based learning requires learners' deep involvement in active learning, during which they pretend, plan, collaborate, implement and adjust knowledge and skills for particular purposes [7]. Social, emotional, and cognitive skills can be scaffolded into the playful learning process, all of which contribute to motivation, active engagement, enjoyment and self-efficacy in learning [26, 28]. Skills development is pertinently embedded in such an approach to learning. Including some self-directed learning together with peer collaboration, in a safe environment that allows learning from mistakes, will additionally bolster development of these skills [7, 17].

Combining play-based learning with project-based learning supports the merging of meaningful learning with enjoyment of learning and optimal skills development, alluding to its potential to serve as a suitable pedagogy for entrepreneurship education. The question that remains, however, is: how can playful project-based learning contribute to 'good' entrepreneurship education? The next section endeavored to address this question.

3. Theoretical framework

From the introductory section of this chapter, it is clear that in many instances schools are not preparing learners to thrive in life and work after formal schooling. Schools are historically viewed as "a place in between the home and the street, a transition-place, where we are no longer at home but also not yet in the 'real' world" ([30], p. 1). In other words, schools are viewed as providers of learning with the intention to bridge the gap between learners' home life and the real world 'out there', such as the world of economic production or employment. Schools provide a safe place where learners can practice applying their knowledge and skills, without it having to be perfect [30] and where they can learn from their mistakes [7, 22].

To attain these expansive objectives, the learning provided as part of schooling needs to be purposefully planned to contribute to meaningful or 'good education' (or, in the case of the current discussion, 'good *entrepreneurship* education'). As a point of departure, a shared understanding of what 'good education' entails is needed, in view of the requirement for sound theoretical underpinning of the proposed education. To this extent, Biesta [30, 31] reiterates that there is a need to reconsider the purpose of education – in other words, schools or educational institutions have to consider what is valued in or as 'good education'. Consideration should be given to what education – and the learning embedded therein – "is supposed to be *about* and *for*" ([32], p. 91).

That is to say, it matters what learners learn, as well as what they learn it for – what the purpose of their education is [31]. The point of education is not simply that learners have to learn, but rather that "they learn *something*, that they learn it *for a reason*, and that they learn it *from someone*" ([32], p. 91). A clear purpose for education will therefore contribute to a shared understanding of what is valued as 'good education'.

Professor Gert Biesta has developed and widely published a systematic manner or framework for addressing 'good education' by distinguishing between three functions of education [31], which he refers to as 'domains of purpose' for good education [30, 32] in more recent publications. Biesta's three domains of purpose, namely qualification, socialization and subjectification, each contributes to an understanding of what is valued in education, in other words, how 'good' the education is perceived to be as described in the subsequent paragraphs.

3.1 Qualification

In simplest terms, the qualification function of education is making available (through 'teaching', transmission, or facilitation) knowledge, skills and understanding as part of learning [32]. The qualification domain of purpose is often (though not exclusively) linked to economic arguments, including the role that education plays in preparing learners for the world of work, which in turn contributes to a country's economic development or growth [31]. What is prescribed to be taught can be viewed as being representative of what learning is being valued or "considered to be of value" ([32], p. 92). If, for example, the qualification purpose of education is misaligned with the needs of employers, it results in issues such as the skills gap that employers often report between learners' school education and what they actually need to thrive in the world of work [8, 31].

3.2 Socialization

The socialization function of education supports learners in becoming "members of and part of particular social, cultural and political 'orders'" ([31], p. 40). The socialization domain of purpose therefore helps learners to find 'their place in this world' when particular norms and values – related to cultural or religious traditions – are learned. This type of learning can happen explicitly as part of the intended curriculum, or implicitly as part of the hidden curriculum [32], which may result in both desirable and undesirable learning [31].

3.3 Subjectification

Subjectification – sometimes referred to as 'individuation' [31, 32] – serves a purpose opposite to that of socialization [31]. Rather than socializing a learner into a particular group or 'order', the subjectification function of education is the process through which a learner becomes an individual subject. It refers to how an individual exists as the subject of his/her own life, and not (only) as the object of what other people want from them [32]. Education always impacts individual learners, and education as subjectification could be "described as encouraging an "appetite" for trying to live one's life in the world" ([32], p. 97). Subjectification is not the same as 'identity' (which answers the question 'who am I?'), but rather about "how I exist, how I try to lead my life, how I try respond to and engage with what I encounter in my life" ([32], p. 99). It relates to the educational purpose of what a learner will choose to "do" with

his/her identity, as well as with the education they have received [32]. Subjectification allows learners to understand their "existence in and with the world, rather than [their] own personal or subjective opinions, thoughts, and beliefs" ([32], p. 99).

According to Biesta, "good education should therefore always specify its views about qualification, socialization and subjectification" ([31], p. 41). This is also true for 'good' entrepreneurship education that is theoretically sound.

4. Conceptualization

The theoretical foundations provided by Biesta's three functions of education were subsequently used as an analytical framework to develop a shared understanding of what 'good' entrepreneurship education ought to be, as a starting point. These conceptualizations or considerations are based on the themes that emerged from the literature study for elements to include when implementing entrepreneurship education, as well as bearing in mind that current schooling is often not preparing learners to thrive in the 21st century, resulting in skills gaps and high youth unemployment. It is intended to clarify what 'good' entrepreneurship education ought to be. To provide an at-a-glance overview the conceptualization of 'good' entrepreneurship education as framed within the descriptions of Biesta's three domains of purpose [30–32] is presented in **Table 1**. In the table, the term 'others' refers to individuals or groups of individuals that contribute to learners' socialization, which includes family, community members, religious groups, political groups, culture and more.

In the broadest terms, the conceptualizations in **Table 1** firstly provide insights into the qualification purpose of 'good' entrepreneurship education, that is: which content (knowledge, skills and competencies) needs to be included, as well as how it should be facilitated, to be valuable for learners and to address the reported skills gap, as well as to ameliorate unemployment. Secondly, **Table 1** provides insights into the socialization purpose of 'good' entrepreneurship education, in other words, how learning should be constructed to contribute to learners' development as members of a particular society or in a particular social context. These conceptualizations mainly point out that an understanding of the entrepreneurial mindset of the community (the 'others') contributes to how entrepreneurship education should be approached, they emphasize the need to involve others in the learning process, and that entrepreneurship education should create value for learners as well as for others. Thirdly, **Table 1** provides insights into the individuation or subjectification purpose of 'good' entrepreneurship education, specifically how learners can actively make choices to become more entrepreneurial during the learning process, or regarding what they want to do with the entrepreneurship education they receive. 'Good' entrepreneurship education will contribute to positive changes in learners' perceptions of entrepreneurship and foster intrinsic learning [10].

The conceptualizations for 'good' entrepreneurship education in **Table 1** align well with Biesta's description of 'good education' that requires that "they learn *something*, that they learn it *for a reason*, and that they learn it *from someone*" ([32], p. 91).

The 'someone' in this description refers to learning from others as part of the socialization function of education (**Table 1**), but it also includes learning from teachers, which takes place across all three domains of purpose of education. It can therefore be said that the 'good' entrepreneurship education described in **Table 1** will be complemented by an additional 'element' which emerged from the literature study, namely the changing roles of teachers.

	Qualification	**Socialization**	**Subjectification**
Competencies and skills required for a meaningful life in the 21st century	develop knowledge, 21st-century skills and competencies for entrepreneurship	understand how others view entrepreneurship, to enable amelioration of undesirable learning/negative impact in hidden curriculum	develop the learner as an individual functioning in a complex and changing world, fostering entrepreneurial aspirations
Developing an entrepreneurial mindset	understand the broader value of entrepreneurship education and develop new ways of thinking	understand how own mindset differs from or aligns with how others view entrepreneurship	learners actively choose to develop a positive entrepreneurial mindset
Self-directed employment	learn how to apply entrepreneurship knowledge, skills and competencies to create employment opportunities	develop and foster connections with others, based on shared values, to recognize and utilize opportunities in communities	become self-active to seek and create own employment opportunities
Life-long learning	develop a love for learning and recognition of the need to keep on learning	share learning experiences with others and learn from others' experiences	actively choose to implement self-directed learning principles to keep on learning
The type of learner	make learning more meaningful, enjoyable; adaptable to change; digitally supported	understand how learners' context and socio-cultural background impact their perceptions of entrepreneurship education	become co-constructors of learning, active participants in the process, choose to be more self-directed
Real-life learning for value creation	utilize learners' 'real-life' contexts and experiences to enable application and transfer of learning: to benefit themselves, as well as others	develop partnerships with communities: identify problems to be solved, utilize local knowledge, values and resources	choose to develop self-efficacy, passion, entrepreneurial identity and a personal career vision
Pedagogical approaches	creative, dynamic, innovative, collaborative and learner-centered; experiential problem–/project-based learning	structure learning around exploring and solving ill-structured problems relevant to or in learners' communities	make connections to make learning more meaningful to the self, choose how this learning will be used in own future

Table 1.
Conceptualizing 'good' entrepreneurship education.

The descriptions in **Table 1** focus on the construction of entrepreneurship education as a process for learners, therefore the roles of teachers – as facilitators of the learning process – are presented separately. Teacher education is viewed as preparation for teaching, and therefore not always perfectly aligned to what transpires in practice in their classrooms. It is, however, vital that teachers be suitably prepared to enable them to facilitate 'good' entrepreneurship education, and therefore their changing roles need to be considered [2, 3, 10, 26]. Analysis of the changing roles

of teachers through the same framework Biesta [30, 32, 33], contributed to insights and conceptualization how their roles can contribute to 'good' entrepreneurship education. As part of the socialization purpose, teachers must invite and value input and contributions from others, for example successful entrepreneurs, community members, or elders, who have knowledge of and experience in entrepreneurship. This approach will broaden the learning experience to include more real-life learning, adding to the value and meaningfulness of such entrepreneurship education. As part of the subjectification purpose of 'good' entrepreneurship education, in which they serve as guides to support learners in to make informed choices, to adapt to change (including learning from mistakes), to choose to become more self-directed and to develop learners' aspirations for continued (or life-long) learning [3, 7, 11, 26]. Finally, teachers contribute significantly to the qualification purpose, which indicates that they must become active facilitators, catalysts and scaffolders of learning, rather than merely transmitting knowledge [11, 17, 22]. These roles in turn highlight the important pedagogical choices teachers have to make to contribute to the effectiveness of their implementation of entrepreneurship education, to optimally benefit their learners.

The above conceptualizations provide insights and theoretical foundations for constructing 'good' entrepreneurship education, which brings us to the final part of the research question that guided this investigation, namely: "how can the pedagogy of playful project-based learning bolster 'good' entrepreneurship education?"

5. Playful project-based learning as pedagogy for entrepreneurship education

"Play exemplifies one of the highest forms of experiential learning" [34]. Despite the perceived dichotomy, which often situates play as the "antithesis of work" ([35], p. 53), research on the contributions of play to learning is mounting. Play therefore provides opportunities for a different type of learning than what was traditionally associated with 'schoolwork'. In broadest terms, play can contribute to experiential learning in three ways: (1) by supporting learners to take charge of their own learning, in line with their own standards of learning; (2) both as part of the process of learning (and the experience thereof) and the outcome of the learning; and (3) through repetitious cycles of learning, which contributes to deepening the learning in each cycle [34]. Play has therefore developed from being viewed as a "reward for completing academic work [to] a context in which academic work unfolds" ([35], p. 69). Although play pedagogy is mostly associated with free play, different types of play are used for learning and involves different role-players. Play-based pedagogies expressly include teacher involvement at varying levels [35]. Depending on the extent of the teacher's involvement in play-as-learning, it can become a well-planned, structured learning experience, which contributes to academic learning and skills development [35, 36].

The educational benefits of play are frequently categorized as being either developmental (such as self-regulation, social- and emotional skills development), or academic (such as numeracy and literacy) [35]. However, increasingly, the essential relationship between play as teaching-learning strategy and entrepreneurship education, is being reported [36–39]. Play-based teaching-learning strategies develop entrepreneurial knowledge, as well as several of the skills and entrepreneurial characteristics required of learners to thrive in the 21st century. Some of these include

problem-solving strategies, imagination, language- or communication skills, co-operation - or teamwork skills, money- or financial management, taking calculated risks, and being future-orientated [36–40]. To enable this education, problem- and project-based learning is often utilized to promote or facilitate playful learning [3, 16, 25, 29]. In addition to developing meaningful, active, engaging and socially interactive learning [25], play-based education contributes a 'fun' element, making learning more enjoyable [25, 37].

Furthermore, although play-based pedagogies are most frequently utilized in early education (that is, education for younger learners) [29, 36–38], it is increasingly being used in adult education – for example in teacher education [41], and even for retirees [38]. Still, it is reiterated that exposing learners to entrepreneurship education early can "lead to an enormous change of mind to building a healthy adolescent" ([36], p. 64), underscoring the constructivist and expansive positive potential of such learning.

A few examples of well-developed playful project-based learning as pedagogy for entrepreneurship education have already been reported from diverse countries such as Australia [25], Canada [35], Indonesia [37], Morocco [38] and Pakistan [36]. All five these studies were focused on play-based learning as part of early childhood (pre-school) education. Additionally, a brief overview of the types of play utilized, types of approaches used, and the reported effects of play-based learning on the development of learners in each country is set out in **Table 2**.

Another descriptive example emerged from Mexico, where learners create "new minicompanies through playful activities" and use multiple perspectives ("economic and social factors and the needs and capabilities of their community") to analyze business projects ([40], p. 295). In addition, the playful project-based learning from Mexico is reported to develop learners' knowledge about creating and managing small businesses; creating value for others; as well as learning about financial administration [40]. This example reflects education *for* entrepreneurship, which brings the learning closer to creating an "entrepreneurial experience" ([40], p. 303) and therefore transcends mere education *about* entrepreneurship. Through this pedagogical approach the transferability of entrepreneurship education is fostered, expanding its value for learners and communities [28]. The example from Mexico also serves the particular purpose to ameliorate unemployment in that country [40].

Other studies exploring playful project-based learning as pedagogy for entrepreneurship education are on-going, for example, in South Africa the Department of Basic Education intends to implement playful project-based learning across all subjects and into all different school phases of the current school curriculum [29, 42]. This plan (like many others across the globe) is still being developed and is in its early stages of implementation, underscoring the need to continue investigations into the suitability of playful project-based learning as pedagogy for entrepreneurship education, and how this can be bolstered.

To contribute to this growing body of knowledge, the conceptualizations developed for constructing 'good' entrepreneurship education earlier in this chapter, theoretically underpinned by Biesta's three functions of education (qualification, socialization and subjectification), were used to contribute insights into how the pedagogy of playful project-based learning can bolster 'good' entrepreneurship education (**Table 3**).

The comparison in **Table 3** indicates that the pedagogy of playful project-based learning holds considerable potential to positively contribute to 'good' entrepreneurship education. As part of the qualification function of education, playful project-based learning can (and does) contribute to the development of knowledge, skills and

	Types of play utilized	**Types of approaches used**	**Reported effects of PPBL on development of learners**
Australia	learning through play; integrated pedagogies (child-directed activities with intentional educator facilitation)	active learning, cooperative and collaborative learning, experiential learning, guided discovery learning, inquiry-based learning, project - and problem-based learning, and Montessori education	development of learners' cognitive skills; creative skills; emotional skills; physical skills; social skills; learning becomes more meaningful and joyful; learners iteratively and actively involved in socially interactive learning; adding learner choice and voice to the learning process [25]
Canada	free play; teacher-guided play	play-based learning	offers a meaningful context for children's academic learning; promotes children's exploration and discovery; enabling the development of higher-level thinking skills through inquiry processes [35]
Indonesia	traditional games	playful games to develop entrepreneurship education	the games and the instructions developed and improved learners' entrepreneurial spirit; enriched personal characteristics relevant to the improvement of learners' entrepreneurship characteristics; fosters commitment toward entrepreneurship [37]
Morocco	serious games	Montessori approach	allows learner independence while acquiring manual and communication skills; develops imagination, a positive attitude and skills; increases enjoyment of learning; promotes entrepreneurial thoughts [38]
Pakistan	free play activities; role play; playing games	'play strategies'	improved social behaviors; collaboration, exploration, problem-solving, decision-making, and innovation, positive social habits; development of entrepreneurship skills and –spirit [36]

Table 2.
Comparative analysis of studies reporting playful project-based learning.

competencies for the 21st century, and these can be modified to explicitly relate to entrepreneurship education [36–40]. Both share the requirement for active, real-life teaching-learning approaches to enhance its implementation in practice [36–39]. What is not yet apparent in the pedagogy of playful project-based learning, is the purpose of value creation (for learners themselves, as well as for others). 'Good' entrepreneurship education additionally includes a strong purpose of preparing learners for the world of work, which is not generally emphasized in playful project-based learning [36]. As playful project-based learning pedagogies are primarily used for the education of young(er) learners, the world of work might seem a long way off, reducing the need to make this a key purpose in play-based teaching-learning.

	Qualification	Socialization	Subjectification
'Good' entrepreneurship education	develops entrepreneurship knowledge, 21st-century skills and - competencies, using active teaching-learning strategies, to create value and meaningful learning for life and work	teach learners to contribute value as members of a particular society, consider others' entrepreneurial mindset, as well as their potential to contribute to entrepreneurial learning	guide learners to make informed choices regarding becoming more entrepreneurial, foster positive perceptions of entrepreneurship and life-long learning, including self-directed employment
Playful project-based learning	develops knowledge, 21st-century skills and - competencies, using active, engaging, experiential teaching-learning strategies	social interaction is encouraged, especially with peers and teachers; values developed, especially as part of early childhood learning	amplifies motivation, enjoyment, self-efficacy and self-regulation in learning;

Table 3.
Contrasting playful project-based education and 'good' entrepreneurship education

The socialization function for 'good' entrepreneurship education and playful project-based learning are divergent. In entrepreneurship education, the socialization function emphasizes consideration and the impact of others' values and norms on the learners' development [3], whereas in playful project-based learning the focus is on socialization with others to develop the learners' own values [25, 35]. Again, this might be attributed to the fact that playful project-based learning is more frequently utilized for younger learners, who are still developing these qualities.

With reference to the subjectification (or individuation) purpose of 'good' entrepreneurship education, there are some consistencies and some inconsistencies. Both contribute to a positive learning experience and both contribute to developing the learner's 'self' [6, 9, 25, 34, 36, 43]. Entrepreneurship education is, however, more focused on development of the learner for the (more distant) future, that is, life after school and the world of work, including self-directedness and making informed choices [7, 11]. Playful project-based learning pedagogy, on the other hand, has a more immediate purpose, for the (present) development of learners' identity, enjoyment of learning, self-efficacy and self-regulation [25, 34, 35]. Yet again, this might be attributed to the fact that playful project-based learning is more frequently utilized for younger learners, who need to develop qualities such as self-efficacy and self-regulation, before they can advance to more complex cognitive and affective decision-making processes, such as making informed choices for their futures, or choosing to become more self-directed.

Notwithstanding these few minor differences, when playful project-based learning is selected as pedagogy for entrepreneurship education, with a few minor adaptations, it can align exceedingly well with the requirements that frame 'good' entrepreneurship education. This pedagogical approach will bolster the effectiveness of the implementation of entrepreneurship education, which in turn will contribute to more meaningful, enjoyable and valuable learning for learners. When more learners actively choose to self-directedly develop their own employment, the high unemployment levels will be ameliorated. Even if learners do not 'become entrepreneurs', the skills and

competencies which they develop as a result of 'good' entrepreneurship education will contribute to reducing the reported skills gap which currently exist between schooling and employers, making these learners more employable and bringing them closer to a better life in the 21st century.

6. Conclusions

The three 'domains of purpose of education' developed by Biesta provided a relevant framework for exploring the theoretical underpinnings of 'good' entrepreneurship education. More detailed insights with regard to the qualification, socialization and subjectification purposes of what 'good' entrepreneurship education ought to entail, could be conceptualized. Playful project-based learning pedagogy can align exceedingly well with the requirements that frame 'good' entrepreneurship education and can be adapted through small adjustments to increase this alignment and its suitability to bolster this valuable education.

This study's comparative overview highlights that there is a need to continue to explore and investigate playful project-based pedagogy for 'good' entrepreneurship education. Playful project-based learning holds much potential to contribute positively to the development and expansion of 'good' entrepreneurship education, especially for young(er) learners. However, particularly when play-based learning is intended for older (more developed or 'mature' learners), careful consideration should be given to better align the socialization and subjectification functions of this pedagogy to the requirements of 'good' entrepreneurship education.

Author details

Adri Du Toit
Faculty of Education, North-West University, Potchefstroom, South Africa

*Address all correspondence to: dutoit.adri@nwu.ac.za

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Challenges and New Perspectives in Early Child, Elementary and Middle School Education

The Learning Situation in the Computer-Oriented Centers for Children in Tunisia, Interchangeability, and Interdependence: Contexts, Challenges and Experience's Building Ethnographic Approach

Abdessatar Rejeb

Abstract

There are several non-formal learning experiences related to the use of computer technologies. Tunisia presents one of these experiences that merits study. I have devoted part of my research to this matter, non-formal education. In this chapter, I have studied the experience of the computer-oriented centers for children. The study was conducted in the educational year 2002–2003. The importance of the data in this study remains reliable to this day. The goals of this chapter is to examine (1) the impact of elements of non-formal learning situation to the informatics project realized by children in its centers, and (2) the impact of the problem situation to social reality shaping, and (3) the impact of the use of computer technology in a learning situation that is different from the formal learning. I consider that a careful constructivist analysis is required to achieve this objective. The results show that an organizational context that operates according to a logic in which social knowledge is interconnected. So, to attain these results I proceeded with an ethnographic approach. I observed 60 children in 67 sessions; each session lasted 1h: 30 mn. I analysed interactions between children and between children and their educators, its are the product of a cognitive and affective commitment, that oriented by the principle of reciprocity.

Keywords: non-formal learning, pedagogy, strategy, child, computer, technology, informatics, interactive competence, ethnography, situation, context, socio-cognitive, negotiation, socialization

1. Introduction

The topic of learning invites us to think about schools, colleges, and universities; what is called formal learning. But learning is very large than this signification. It recovers different fields, like, informal and non-formal learning. In Tunisia, this diversification of learning framework had a long time, experiences have started since 1964s when the youth, childhood and sports affairs secretary has implemented the first non-formal institution [1–3]. Throughout its history, this educational experience has been impacted by the factor of technological innovation. In 1996, child-oriented computer centers were created [4].

These centers offer computer training (informatics, multimedia, internet, technical maintenance…) to children aged between 5 and 15 years. I studied this experience in my doctoral thesis that I obtained in 2006 at the University of Tunis, and one of the dimensions I studied was the ethnographic analysis of the non-formal learning situation. I'd like to say non-formal learning each activity of learning organized as elective after-school time or extra-curricular activities or even scholar vacancies [5–7]. I'd like to mention that the results of this study remain reliable to this day. To my recollection, there has not been a similar study in the Tunisian context in this degree.

The empirical work allowed us, to follow how the social dimension intervenes in the elaboration of the cognitive and to see the relationship between cognition and social configuration [8]. Focusing on this reciprocity helps us to better understand the impact of computerization on learning and the context of training and education [9].

The reciprocity marked the experience of these institutions and allowed them to acquire a learning identity that went beyond the conditions of activity in the non-formal context (framework of leisure/free time), without coming close to the determinants of formal teaching practice. I am facing a different model of leisure/free time institution that gives a non-certifiable but solid training service to attract children.

The diverse presence of the variable Computer-Culture in the daily life of children reveals a diverse presence of the spaces created to accommodate them. Although, studies are abundant which relies on this, problem and remains unexplored as required by the acceleration of the changes experienced in this period of history where the world has become a de-compartmented and inter-accessible space.

In this study, I adopted a social constructivist paradigm [10–14] for understanding how children can use experiences in informatics, multimedia and internet and other activities non-formal learning. This framework enables us to understand how interactions emerge in a situation where children are using computer technology, and how children's behavior reflects interpretative procedures, how this reflective process is progressively internalized the norms, habits, expectations, abilities, and understandings of community of practice become part of the identity of individual [15, 16].

My approach is socio-cognitive, aiming to identity the change achieved in spaces of socialization [17–19]. How does the child's social world (People, Objects, Symbols) appear through the process of constructing the reality of using the computer tool?

2. Aims of the study

This chapter aimed to gain understanding:

- The impact of elements (program, educator, children, informatic technology) of non-formal learning situation to the informatic project realized by children in child-oriented computer national centers (CNIPE/ COCNC) in Tunisia.

- The impact of the problem situation (non-understanding information, non-anticipation stimulus) to social reality shaping

- The impact of the use of computer technology in a learning situation that is different from the scholastic situation (formal learning).

3. Research design

3.1 Research method

The methodology framework is based [20–23] on the ethnographic survey. I used a grid to observe the learning situation and consider the learning situation in which children obtain knowledge and skills in the computer field. The training location was equipped with computers and organized in a semi-circle where computers are adjacent to the wall and the screens face the center of the room or as a classroom. A blackboard is placed in the middle of the classroom. This is a space of negotiation where each child or group of children presents their work in form of computer production to peers and jury.

3.2 Sample

The research groups of my study were formed by children who had to participate in the session of training that planed from Mars 2002 to December 2002. Each session has been formed by children between 9 and 14 years old, which was been distributed among the training rooms according to the training modules. The average number of children in each group is about 15. So, I observed 60 children in 67 sessions; each session lasted 1 h: 30 men; hence the total number of hours of observation is 100 h 50 mn. The program has been determined according to the following calendar:

1. Module from Mars 22nd, 2002 to Mars, 30th, 2002 (8 sessions/ 15 children)

2. Module from June 04th, 2002 to June 30th, 2002 (26 sessions/ 15 children)

3. Module from July 01st, 2002 to July 27th, 2002 (26 sessions/ 15 children)

4. Module from December 23rd, 2003, to December 31st, 2003 (8 sessions/ 15 children)

The sample of this work was complex. Its complexity comes from the complexity of the social reality. Since my research is comprehensive, I focused on the quality of the information I received. So, the essential thing was to respect the principle of saturation and the principle of diversification and the principle of repetition [24].

3.3 Analysis and evaluation of the data

The ethnographic description of the learning situation allowed to follow up in detail the children's use of computers (actions and practices). The children's actions in such a situation should describe:

- The child's posture (actor): social, cognitive, bodily ability, and behavioral consent

- The child's engagement as an actor

- The child as an actor

- Types of practice: conceptual, discursive, written.

- Elements of the situation: space, persons, groups, ideas, texts, designs, objects, tools, organization, regulatory instances.

- The temporality of the activity

- Construction of dialog: discourse structures, significations, contextes, situations

- Interactions: form, realization, models, processes

All observations were related to the educational period 2001–2004. I used the following observation framework:

4. Results of the study

The use of computers by the child in a learning situation is considered as a collective experience where the child changes position, from individuality to participation and interchangeability. The observation of the children's actions verbal, interactions, allow to reveal the process of constructing the reality of the computer utilization and to observe the impact of the pedagogical approach of the instructor.

Journal Session N°: .... Date: .... Subject of training:		
Time context	Observation	Commentary/explanation/ interpretation
Indicate the chronological progression of the lesson.	In this column I Note all details according to the criteria: • The child's posture • The child's engagement as an actor • The child as an actor • Types of practice: • Elements of the situation • The temporality of the activity • Construction of dialogue contexts, situations • Interactions: form, realization, models, processes	explain and interpret data according to the criteria: • Communication with the educator • Communication with the child • Exchange of information • Exchange of experiences • Assimilation of information • Common use of the computer • Work execution • Quality of work • Understanding • Mobility in class

4.1 Starting situation, challenges, and significations

The activity session of the children's computer center starts by welcoming speech and organizing them into workstations in which they choose their team partner. In the first session, the educator reminds of the rules of work and stresses the importance of cooperation and participatory work, then presents the program and writes on the board the specific goals (**Figure 1**).

The instructor asks questions to motivate the children to interact and cooperate in answering. This method helps to establish forms of interdependence and cooperation [25]. At this moment of the session, there was no use of computers. The instructor noted that it is necessary to give the children time (1/2 hour) to familiarize themselves with the learning situation. I have noted that this waiting period gives children the feeling of frustration. Therefore, they start using and making a connection with the computer. This behavior was expected and interpreted by the opposition of two positions and two roles, the role and position of the instructor and the role and position of the computer.

The interactions' process gradually develops the position of children on the workstations during the instructional activity. The interactions are extended to the dyads that are placed in proximity. This extension to the workstation in proximity can be realized by a verbal or sensory-motor action and then it is translated into the common use of computers.

The information is transmitted through this interactional process and is transformed from the abstract to the realization. The realization takes two forms:

- Realization using the tools of computer writing.

- Realization via the transmission of information from the perceptual to the praxeological level (**Table 1**).

The starting situation leads to common challenges linked to the content of the training and generated through the interactions at the time of learning. The child manifests a need to go beyond the level of acquisition proposed by the instructor. Through the various interactions, he or she will try to find ways to satisfy this need.
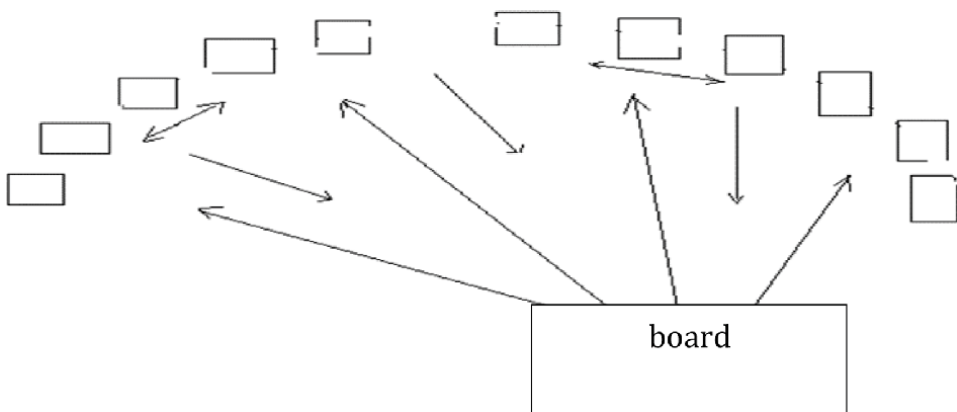
Figure 1.
Design of the learning space.

Starting situation			
	Situation	**Challenge**	**Signification**
1	One of the children tried to find access to the internet by going beyond the instructor's directives.	• Acquisition of knowledge that is different from that which is the subject of the learning process. • A form of distinction and excellence • A way of self-affirmation where the child has used the computer	**Value of overcoming**: • The value of overcoming the self is its importance in the life of the child • Objects (computer tools) are transformed in a situation of self-affirmation into a relay of overcoming
2	The screen goes off. One of the children panicked. The second was able to solve the problem with a confident attitude. They repeated the same manipulation	• Knowledge acquisition • Self-affirmation • Complementarity between pairs • Inculcation of knowledge	**Value of cooperating**: • Objects are transformed into a link of transmission of expertise • The repetition of the exercise appears as an act of familiarization with the acquired knowledge • Spontaneous interactions develop exchanges between pairs
3	One child changed dyad; he justified his behavior by the fact that he did not find his chance to work with his older female classmate. With his new male classmate, he found more opportunities in the use of computers.	Adequacy and equity	**value of equity**: • The incompatibility of the pairs' skills can create learning obstacles that negatively influence the apprenticeship. • The freedom to move between the dyads allows the child to find optimal alternatives to solve difficulties.

Table 1.
Starting situation, challenges & significations.

Self-affirmation appears to be one of the major challenges at the time where a child starts looking at computer. The object takes on an instrumental dimension and allows the child, to realize the overcoming of self. Through this practice, the child has transformed the computer into a resource that can be used.

This transformed attitude was reinforced by the instructor's interventions and by the children's prerequisites. The capacity of knowledge plays an important role in appearing other challenges. It is through the building capacity process that the child reinforces their knowledge and skills. The reinforcement of knowledge becomes in itself a goal for the child, even when exchanging with peers. The repetitioned exercise provides children the opportunity to gain skills and become familiar with this new information.

This exchange confirms the existence of interdependence where information technology is transformed into links through the intermediary of experience transmitted between children or dyad to other. These spontaneous interactions, resulting from the informal relationships between children, contribute to develop the exchange. The symbolic violence of the educator might refrain from the fluidity of the exchange.

Homogeneity and equity that represent a referential for inclusion and fruitful participation for the children, were found among the major challenges. Incompatibility of skills between peers can lead to difficulties in achieving the learning objectives. If children are allowed to move freely in the classroom, they create other alternatives. This attitude reveals impressive creativity that helps to optimize human and material resources.

Moreover, if children do not feel integrated into the group, I am not surprised to see their disengagement. This attitude of the children is observed when the educator does not give importance to the principles of dyad formation at the beginning of the session (homogeneity and equity). A feeling of strangeness may affect this category of children and be expected to become disengaged. I might consider that the lack of challenge is itself a challenge that is relevant for learning and integration needs.

4.2 Engagement situation, challenges, and significations

How are the dyads formed? In the beginning, the peers are formed arbitrarily, sometimes the instructor intervenes to change some peers. At this stage, I cannot consider that these partnerships present dyads with challenges. When the child agrees to continue working with his partner or tries to change him, it is noted that the dyad has been formed. It takes some time for the two partners to get to know each other and become familiar with each other. Learning sessions can start with theoretical content or with a practical exercise. If the session has opted for the first approach, and then application, it is noted that computer technology does not play a role in the exchanges established by the children. The (theoretical) informatics knowledge encourages the emergence of a form of exchange that I can describe as "interchangeability that prepares the children to enter into an expected context of the application, a context for acquiring practical informatics skills".

The theoretical activity in this training is a way of furnishing the learning time in which the instructor continues to drow attention to the new knowledge using the pedagogy of asking questions and consolidation. The board is the main medium for transmitting information. Children's participation starts partially with short answers charged with technical words and then evolves through interdependence that is enriched by the content of their short answers. Distance plays a decisive role in the process of building common knowledge. The closest children bond over the contribution of the last participation.

I noted massive participation especially from those who are in front of the instructor. Distance plays a role in establishing interchangeability between children and it motivates competition and develops a sense of belonging to a psychological sphere of activity. Proximity has an impact on perception [26]. Distance influences perception, which improves the child's ability to observe.

The direction of the sensory-motor interactivity changes every time the instructor changes the orientation at his/her view. This attitude of the instructor generates a dynamic participation of children based on anticipated want to hear the answer to their questions. This environment encourages interaction based on interdependence within children and allows the development of newly exchanges between dyads. The ability to memorize and the appropriate use of the board allows the child to acquire information better. The common method used by the instructor to help assimilate the information is to make the children responsible and give them the role in explaining the contents. In this situation, the child becomes the transmitter of technical knowledge to others.

In case that the theoretical section takes a long time, children's concentration might decrease, and they turn to use the computers without looking at the instructions. This attitude of the instructor is considered a disturbing factor. Computer resources can offer the instructor the opportunity to provide this theoretical content without boring and stressing children When moving to learn practices, the dyads take the same division as at the beginning of the session. At this stage of the learning process, the computer screen is transformed into a field of execution and experimentation. And so, the peers make a decisive contribution to the development of the exercises and the work. Readjustment of achieved tasks is influenced by proximal interchangeability. The computer skills transmitted by the instructor are not limited to the achieved application of but enriched though peers' exchanges. This type of exchange seems to help those who have not been able to complete their work. It reveals that knowledge of computers can be transmitted between children.

At an advanced stage of the project, the instructor requires the children to be stable in the workplace. The objective is the sustainability of the execution and achievement of the work. The rhythm of the application evolved, and the children manifested an affective engagement, and exchanges between individuals and between stable dyads increased. The challenge for the children was to present quality products.

This full engagement affects [27, 28] the children's choices to the extent that they expressed their willingness to sacrifice time for recreation. At the time of the recreation, I noted that the dyads that had been close together expanded to form quartets. This reconfiguration is explained by the impact of the proximal exchanges that were established throughout the first part of the session. The focus of the children's discussions in the recreation confirms this explanation. The children continue to discuss their work and compare their productions.

The degree of involvement reveals the quality and profit of the participants. The issue was that they could finalize their projects with the desired standing. The importance of this point appears in the relationship identified between the variable interchangeability and the variable stress of the learning situation. The more interaction and exchange there is, the more it helps them to get rid of the pressure of the starting situation. A competitive atmosphere starts to develop as soon as the instructor announces the start of the presentation. The presentation is of considerable importance to the pairs. The image of the expert who has provided them with the act of exposition consolidates their self-esteem.

The more the instructor respects the criteria of homogeneity in the age and prerequisites of the children, the more the exchange and regulation strategies adopted by the pairs optimize their impact on the quality of the computer production. The moment of exposition represents for the children a moment of exploration where they evaluate to what extent they have been able to exceed their limits and deepen their knowledge and skills. The act of self-evaluation will only be accomplished by comparing one's work with the work of other children in the group. This act of self-evaluation is like repositioning of the "expert-self" and thus the child identifies his or her status and capability.

It is considered that the achievement of 2/3 of the group in their required work is a criterion of success for the instructor. It is due to a differential pedagogy that he was able to adjust the achievement and correct the mistakes. The difficulties encountered during the exercise allowed the instructor to use regulation and facilitation strategies. This is a way of accompanying the children in their cognitive quest.

4.3 Negotiation situation, challenges, and significations

The informatics productions that are, given by peers, appear to be important for the evolution of the children's experience in this learning context based on the use of computer technology. This use permits the development of technical and interactive skills in the child. I also considered that this situation is a negotiation situation. This negotiation activity emerges from the fact that the child (or the dyad or the working group) gets bogged down in an exchange where verbal realization and computer realization fail to complement each other to produce a unified discourse, through which the child tries to convince the audience with his/her product. This negotiation situation requires the children to choose words that help more to explain the work and that allows them to answer the questions of the instructor or the examiners.

The following table presents empirical data related to the negotiation situation defined in the previous paragraph. This situation was seen as a critical incident/act. The ability to negotiate was exposed through a cumulative process of learning, exchange, and sharing that offered us the possibility of observing the conditions of construction of the relationship between technology and the child's socio-cognitive reality (**Table 2**).

Negotiation situation			
	Critical incident	**Challenge**	**Signification**
1	Presentation of a computer application that is about "how to consolidate global solidarity ". Practical use of local data to develop a discourse on the topic Access to the internet to get the necessary information Use of Arabic and French to present the work (the use of French was mostly in the technical content of the presentation) Collaboration to respond.	• Convincing • Valorize the effort • Complementarity	• The existence of real challenges in negotiation related to the recognition of effort, • the recognition of competence and expertise in the field of IT
2	Difficulty in starting the application Recourse to a member of the panel of examiners Attributing the error to the operating system Focus on the technical dimension and ignore language skills	• Surpassing the limits of one's abilities • Assigning value	• Recourse to the adult helps to overcome obstacles • Attributing the mistake to the technology helps to offload responsibility • Language is the basis for negotiation

3	Regulation and technical correction at the time of the presentation take time away from the speech Speech rebounds on what is being seen on the screen Fingers and clicks on the keys sometimes take the place of verbal communication	• Regulation
		• Manipulation
		• Alternation (with technology)
			• Presentation within the framework of a dialectic of silence/pronunciation (to say).
			• The speech that the children produce ranges from digital to verbal to fill the time of the presentation. This time is made up of two moments:
			  1. Silent time (the time when the application speaks)
			  2. Time of speech (Time when the child speaks)
			• This situation is called "alternating with the technology".

Negotiation situation			
	Critical incident	**Challenge**	**Signification**
4	Optimization of the time taken to realize the informatic application so as not to disrupt the interactions Giving importance to ergonomics	• Esthetics, ergonomics	• Any IT product that does not generate the possible interactions will not be convincing.
5	Attracting the audience's attention Feedback in an IT usage situation will only be easy if the social situation is real and not virtual	persuade	• The esthetic (ergonomic) part of the work seems like a socio-artistic scene-setting
6	Sometimes the child cannot justify one of these technical choices and so has resorted to uncertain speech to explain.	To Master of Computer	• The challenge is not a theoretical-cognitive one, but a technological one that requires the child to transform the computer from an intractable, impractical tool into a manageable, practical, and obedient tool
7	The relationship with the computer is manifested through the desire to master and control it		• Capability is a result of the mastering of technical information and the mastering of technical information is a result of the application

Table 2.
Negotiation situation, challenges, and significations.

The negotiated situation looks like a competitive situation where the child uses these linguistic, logical, and technical skills. Negotiation is a communication operation in which the two parties involved (children/instructors or examiners) present their views on a subject [29]. It is a form of bringing together two points of view or two representations. The children showed negotiating behavior about computer technology, which at the beginning of the negotiation appears as a response to a real challenge. At the beginning of the negotiation, this behavior appears to be a reply to a real challenge. The child is called upon to be confident of in his or her skills and expertise. This reveals the existence of a link between the child and IT, through which he or she manifests the desire to execute control of the machine. Sometimes the computer deprives the child of the initiative and fixes him/her in his/her limits and/or potentials. Therefore, it is sometimes found that the child attributes to the device a certain responsibility at the time when he/she will be handicapped to mention a certain ability allocated to IT. The challenges at the time of exposure are multiple, theoretical challenges, technical challenges. This requires that the child can transform the computer from intractable and impracticable to a manageable and practicable and obedient tool. This is only possible because of the close link between the child's ability to manage the computer tool and the technicality he or she has acquired in converting his or her knowledge and skills into a useful and convincing computer. The technical norms of the evaluation of these productions only become advantages if they optimize conclusively and persuasively the syntactic, ergonomic, and symbolic registers of IT.

5. Discussion

(Support your results by citing the previous studies, if there are opposite results of the studies in this topic, please also cite them in the discussion part of the chapter)

In this chapter, I explore a new context in learning where the child becomes an actor who builds his learning experience. Interaction's child towards computer, peers and educator appears as a manner of shaping virtually through inter-exchange between there (child, computer, peers, educator). The development of learning influences the informatic project realization of children and other hand the progress of their work consolidates and accumulates their acquisitions. This result had different from the results of M.Rousso [30]. Roussou mentioned what she called a central thread in learning, play, as well as an essential characteristic of virtual reality environments: interactivity. While I have focused on the dynamics that contribute to the construction of learning as a product of interchangeability between children the computer and the educator the output of the learning situation where the child appears to be an actor in this learning experience. Although, we agree on the framework in which the child exercises his or her learning experience, which is informal and leisure time, my results differ from her that I give the child the status of an actor who impacts on the learning process and the work output through participation. Whereas, she explored a central thread in learning, play, as well as an essential characteristics of virtual reality environments. Which implies that she examined interactivity about learning, play, narrative, and to characteristics inherent in virtual reality, such as immersion, presence, and the creation of illusion [30].

In other studies, Shaffer suggests the concept of epistemic frames as a mechanism through which students can use experiences in interactive learning environments (video games, computer games ...etc) to help them deal more effectively with situations outside of the original context of learning. When computer-supported collaboration means computer-supported competition: professional mediation as a model for collaborative learning [31–33]. Although, I agree with him on the influence of the computer technology variable on the learning process, and on the use of almost the same conceptual background (Understanding frames, structures frames due to the inspiration of the same theorical referential: phenomenological theory, constructivist theory) but my hypotheses differ from his. He was interested in a formal context while I was interested in a semi-informal context that is managed by institutional rules that reflect an organizational reality that of the COIC (child-oriented informatics centers).

Tisza & al surveyed informal and non-formal learning activities in nine European countries. They investigated the relationship between the targeted age group and the gender of the participants in these activities and the gender of the activity leader experts and the content and the main goal of the activity. They concluded there is a difference between variables: gender/ activities; gender/ main goal of activity; age/ activities, age/ main goal of the activity [34, 35]. I consider these results very important; but they cannot be compared to my study because of the difference in methodological approach. Nonetheless, I can serve as a basis for comparison for future studies when I adopt the same methodological design as the study by Tisza et al.

I note that the field of research is influenced by technological innovations. For example, two of these technologies have influenced learning, virtual reality, and augmented reality. It is important to see what impact these two technologies have non-formal and informal learning and to compare the results with those I have presented in this study. It is also important to see how the reality of the use of virtual technologies is constructed and to reveal the strategies of this social construction and the challenges of interchangeability adopted by the children in the non-formal learning. I can use as a starting point the article by Lewis & al [36], which presents an interesting literature review.

6. Conclusion

My study contributes to the growing literature in the following ways: a) I have provided a look at a non-formal learning experience in a Tunisian context marked by those cultural, socio-economic, and institutional variables. b) I shed light on the status of children and their role to manage this experience of non-formal learning. I have provided an opportunity to see how the challenges of using computer technology are generated and how the significations of this use are constructed. To know how computer technology has been integrated into a local context that has not contributed to its emergence and development is crucial to follow up on the individual, community, and institutional strategies adopted in the use and processing of this innovation.

From this ethnographic analysis and this psycho-socio-cognitive diagnosis of the non-formal learning situation experienced by the child in a context of computer use, I can conclude that the experience of computer children utilization is a hyper-complex and multifactorial, and situation. Cognitive and social factors play a role on the experience and its socializing identity. The relationship between these factors ensures the different exchanges between children and the contents of this learning. The development of the child's interactive skills is attributed to this exchange. These appear as knowledge and know-how in charge of providing the child with a status that allows him/her to integrate into a socio and virtual lifestyle.

This study focused on the experiences of children who use computer non-formal learning at child-oriented computer national centers (CNIPE/ COCNC) in Tunisia. Understanding children's experiences and meanings of learning computer use can help educators, policy makers and researchers to develop interventions and guide children towards computer use desirable.

The experiences of child-oriented computer national centers (CNIPE/ COCNC) may influence the environment of education and suggest a new configuration of the different roles, status, and modes of participation in educational situations. I think that increasing these structures which would have a beneficial effect on (1) the diffusion of the scientific culture (2) building a proximal field to improve technical and social competencies (3) can have benefits on children's ability to exchange optimally with their peers.

Finally, it is important to compare our results to other results obtained in other contexts, which we have done in the discussion. The second important thing is to follow the effect of time, of technological innovation on non-formal learning in the local context. This is what we will do in our next studies.

Author details

Abdessatar Rejeb
Carthage University, Tunis, Tunisia

*Address all correspondence to: rejebabdessatar@gmail.com

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Students' Digital Photo Stories about School Spaces for Safety and Learning

Anneli Frelin and Jan Grannäs

Abstract

This study explores students' photo story input into how to create a safe and sustainable educational environment. Digital photo stories were collected through classroom assignments at a secondary school in Sweden and the software Microsoft Sway. The students made use of photos and texts to describe what they regarded as safe and unsafe places and places that supported or impeded their learning. The results show variations both in the areas that the students viewed as safe and unsafe and the reasons for their choice of area. This means that one area can be depicted as safe or positive by one student, but unsafe or negative by another, which was also the case regarding learning.

Keywords: digital stories, learning environment, participant-employed photography, school safety, student learning

1. Introduction

The chapter is based on a case study of how to create a sustainable and educational learning environment in a newly opened secondary school in Sweden. The purpose is to enhance our understanding of how students view their learning environments, both inside and outside the classroom. The focus is on their experiences of safe and unsafe spaces, along with spaces that support or impede their learning. The theoretical framework draws on a model for studying interaction in learning environments in order to facilitate an understanding of school practices and the connection between the physical spaces in the school buildings, how the school is organized and the pedagogical praxis. Participant-employed photography and digital stories were used to capture the students' views.

Previous studies of positive school environments from a student perspective have highlighted the role and importance of students' relationships with teachers and peers for their learning and well-being [1–4]. They have also indicated the significance of relationships and places outside the more formal classroom settings in school [1, 5–7].

While it is well known that the configuration of the physical learning environment can support or impede student learning [8–10], it is important to remember that pedagogy also plays a key role and needs to be aligned with the particular space in order to

work as intended [11–13]. Learning more about students' perceptions can contribute to the development of effective learning environments [14]. Here, there is reason to consider the educational environment both in and beyond the classroom, as all spaces in school can become learning spaces [15]. Involving students and other groups can yield a wider and more productive view of an educational environment (ibid.).

Although there is a general consensus about the overall features of safe school environments [16], very few studies have addressed the qualitative aspects from a student perspective [17]. However, students have reported feeling unsafe in spaces that are disorderly and crowded, such as canteens [18]. Contributions to a safe environment include physical features such as well-designed and maintained facilities and social features such as a sense of ownership among its users, high intervisibility and the movement of people [19]. Waters et al. use an ecological perspective to identify the components of a school ecology associated with improved connectedness, health and academic outcomes that contribute to a reduction in violence, such as support, student involvement, clear and fair expectations, well-maintained facilities and positive relationships. A number of international studies have demonstrated that safe environments powerfully promote learning [19–22]. This refers to the absence of aspects such as threats and violence and the presence of aspects that students connect to safety, such as a supportive and orderly environment [22–27].

The Swedish School Inspectorate (SSI) conducts a bi-annual survey covering all students in Swedish schools. A recent survey [28] focused on students in Year 9 (aged 15) and their perceptions of safety, the study environment, the prevention of harassment and school rules, and found that most students felt safe (85%), with boys generally feeling safer than girls. However, 23% of the students thought that their school should work more actively to prevent harassment. Those who felt less safe had a more negative view of the study environment in general. More than half of the students (61%) responded that other students were disruptive in the classroom. Students' perceptions of their study environments have also shown a slightly negative trend over the years.

1.1 A theoretical model for studying interaction in learning environments

In this chapter, the theoretical framework draws on a model developed by the Danish architect Ricken [28] in a research programme focusing on architecture, pedagogy and health. The theoretical model builds on the interplay between these dimensions: physical space, school organizing and pedagogical praxis (see **Figure 1**). The model is empirically grounded and based on a case study of four recently built or remodeled Danish schools. Ricken presents a Venn diagram in which the three dimensions overlap to varying degrees, depending on the extent to which they harmonize with each other. In other words, a well-matched design of learning spaces in relation to the pedagogical mission stated in a school's policy documents and its pedagogical practice gives a high degree of overlap in the dimensions in the Venn diagram. Each dimension can, over time, vary in quality and the match can be better or worse. Hence, the model describes a particular point of time in a dynamic process. As the three dimensions are related, they form a learning environment ecology. One of Ricken's strong arguments in the model is that deficiencies in the matching lead to imbalances in the learning environment.

School organizing stems from the overarching pedagogical goals as they are expressed in national policy documents, such as national curricula and syllabi, all of which have a major influence on the school's pedagogical praxis and functions and the people working there. These aspects are also governed by employment regulations
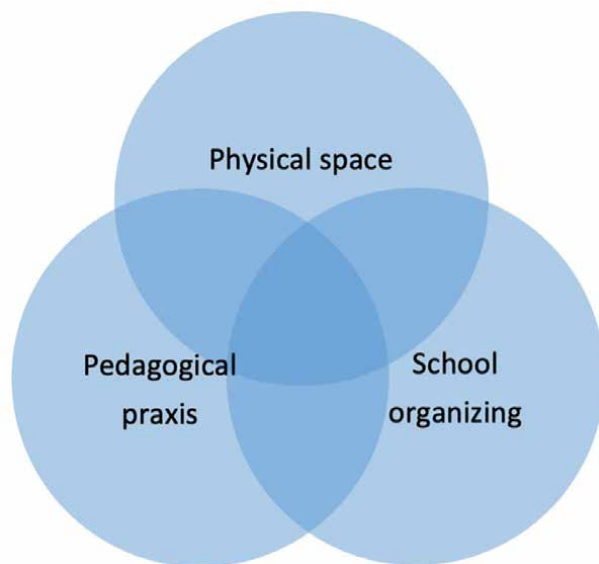
Figure 1.
Ricken's theoretical model: Interplay between dimensions in learning environments.

and schedules that control the flow of people and things and their placement inside and outside the school buildings [5, 7]. By observing the effects of scheduling, how the spaces are used and any possible crowding in parts of the school building during the school day can be visualized.

Pedagogical praxis consists of the enactments of teaching, learning and social interaction that take place in a school. Pedagogical praxis is strongly influenced by the goals that are set for different levels and school organizing. For example, a school's pedagogical programme and the staff's task perceptions, as expressed in both school and staff cultures, are included in this dimension. By observing pedagogical praxis, the creation of aspects such as order and focus can be visualized [ibid.].

Physical space consists of the school building and the things within it. This can include the design of the school, whether the teaching spaces are large or small, the open or closed nature through traffic and how spaces are linked together. It can also answer questions about whether the school has transparent or closed walls and doors, how the light and sound design function and whether there are nooks and crannies, staircases or narrow corridors that could be experienced as safe or unsafe.

Ricken [28] argues that the interplay between physical spaces, pedagogical praxis and school organizing forms an overarching frame for how spaces are used in relation to student agency and students' possibilities for action. What the potential learning environments offer is a space for bodily, social and physical affordances. Affordances, as described by Gibson [29], say something about the relation between that which is perceived and the perceiver, which in turn plays into how meaning and possibilities for action are created. However, at this point a distinction needs to be made between offered affordances and perceived affordances. For example, the physical affordances offered in an alternatively designed teaching space—such as furniture or technology—might not be interpreted by the teacher and student as meaningful or as meeting their needs and thus remain unused. Regarding social affordances, a crowded space could be interpreted and conceived differently by individuals.

2. Research design

The case school, Maple Grove, is a newly opened secondary school (Years 7–9, with students from 13 to 15 years of age) and centrally placed in a large Swedish municipality. After being modernized, it opened as a secondary school in 2015. Thus, in the first intake the students were all new to the school. The fieldwork was conducted over the course of one school year [30, 31].

The data used in this chapter consists of participant-employed photography complemented by digital stories [23, 32] collected in the spring of 2016 during the students' second term at the school. About half of the students forwarded their assignments to the researchers. A total of 17 students participated in the data collection—11 males and 6 females. Eleven of the students were in Year 8 and the other six in Year 9. According to Banks [33], visual research methods are appropriate for the study of youth and their contexts. Digital stories (using the software Microsoft Sway) were collected by means of classroom assignments. The analyzed photo stories are derived from one Year 8 and one Year 9 class. In the assignment, the students were asked to describe safe and unsafe places in the school and the places they regarded as positive or negative for learning. They were instructed to use a combination of photos and texts and to ask anybody featured in the photographs for their consent before using them in the assignment. The photo stories were delivered to the researchers via links sent by email and where emailing was voluntary. For ethical reasons, the photos in the chapter are blurred.

The analysis in this study is based on the theoretical model for studying interactions in learning environments and also draws on Banks' [33] distinction between the form of a visual image and its content. This means that the photos taken by the students have been read externally (form: what we see in the photo) and internally (content: the message that has been sent to us). In addition, thematic analyses were conducted on the digital stories, which involved repeated readings from beginning to end (vertically) and then comparisons of the different stories (horizontally). In the coding process, keywords and key sentences were marked in order to categorize the content of the digital stories and develop prominent themes [34, 35]. The coding process was conducted in two steps: first, by the two researchers reading and coding the digital stories separately, and second, by comparing the coding in order to achieve trustworthiness in the presented themes.

3. Results

Two themes emerged in the students' digital photo stories: their views of the spaces that they felt safe or unsafe in and the spaces that they described as supporting or impeding their learning. The frequencies of the students' views of places they found safe and unsafe, respectively a good place for learning, are presented in **Table 1**.

3.1 Safe and unsafe places

In the central areas of the school, the more trafficked areas are often characterized by intense flows of people buzzing and bustling through them. In the research literature, safe spaces are usually described as places in which people are mobile. Our results show that although some students enjoyed such places, especially those where adults were present, others felt unsafe when surrounded by too many people and subjected to too much noise.

	Grade 8		Grade 9	
	Boys	**Girls**	**Boys**	**Girls**
Safe and unsafe places				
Corridors	iiiiiiii	iii	ii	i
Intense places	iiiiii	ii	i	ii
Quiet places for retreat	iiiii	iii	ii	ii
Spaces for learning				
Silence	iiiiiii	iii	i	i
Teacher-centred pedagogies and flexible learning environments	iiiiiiii	i	i	i

Table 1.
Frequencies of student views.

3.1.1 Corridors

Even though the school management and administrators tried to stagger the breaks and lunch breaks, crowding nevertheless occurred in certain parts of the school building. In some areas the physical space was insufficient in terms of how the timetable contributed to flows of people and things over the course of a day. Places that were designed for mobility, such as corridors, were described as unsafe by some of the boys (see **Figure 2**). A boy in Year 9 explained: "... you never really know what might happen. Sometimes someone might be bullied or beaten. That's not OK. They should make the corridor safer than it is." The use of the word "might" does not make it clear whether something like that had already happened in that particular corridor.

Figure 2.
A place experienced as unsafe: Corridor (boy, Year 9).

However, due to its features and lack of adult presence, the place was experienced as unsafe (with negative potential). What the results revealed was that some places had not been fully taken into account when organizing the location of the school staff during the course of the school day.

The students' experiences of the corridors varied, although the material does point to differences between the girls and the boys. For example, one boy described the corridor in a positive way as a place that he liked to spend time in and where he could talk to students from other classes. In contrast, a girl in his class described the same place as unsafe and worried about the difficulty of getting to her locker: "I constantly think that I might suddenly being pushed, which makes me feel unsafe." She was also worried about getting involved in or witnessing fights between other students and pointed to the lack of presence of teachers in the corridor as a problem.

From the perspective of interplay between the physical space, school organizing and pedagogical praxis, this is a good example of an unbalanced status of the learning environment, in that the corridor was experienced as too cramped and did not allow students to move easily between the locker areas and to and from the classrooms. It also shows that the school staff had not fully interpreted this space and the social interaction that was likely to take place there. The feedback from the photo studies was that such spaces were perceived negatively by some students, especially the girls.

In the analyses of the photos, the girls who described the corridors as unsafe places showed boys gathering in groups and blocking access to classrooms and lockers. The placement of the furniture in this area also made the passage narrower and contributed to making access to the lockers more difficult. Crowding in the corridors also occurred when the students moved between classrooms for their lessons. The furniture in the corridors was rearranged. Interestingly, when the boys photographed the same corridors as the girls, no people were present.

3.1.2 Intense places

Again, looking at the interplay of the dimensions in the learning environment, there are also examples of balanced spaces. The busy main corridor/hall with an adjoining library, café and dining hall was described in positive terms by students who appreciated meeting their friends there. This was also a place in which teachers and other adults were often present and where students had easy access to the staff for informal chats. However, the intense movement of students in these areas at various times of the day was also experienced by some students as difficult. The café area at the end of the corridor was managed by a café host, who was also responsible for looking after and caring for any students who needed extra attention. There was a lot of mobility in this area because it connected the main building and an annexe housing classrooms and the dining hall.

An intense area that was experienced by the students as safe was the adjoining reception area (see **Figure 3**). The receptionist was often accompanied by other adults there, such as teachers, student coaches and assistants (see **Figure 4**). The students commented on the fact that it was densely populated by adults: "I chose this place because I feel safe here and there are always staff or teachers to turn to if something happens" (boy, Year 9). Another boy expressed that more adults were present in other places in the school and argued that there would be less trouble and noise if that was the case here as well.

Figure 3.
A place experienced as safe: Main corridor/hall (boy, Year 9).

Figure 4.
A place experienced as safe: Reception area (boy, Year 9).

The dining hall was yet another intense place, especially at lunchtime when the students arrived for their meals over a short period of time in the middle of the day.[1] Here, in this crowded place, with its constant movement and noise, some students felt unsafe (see **Figure 5**).

> *One place where I don't feel very safe is the dining hall /.../ which is often very crowded and noisy. As there are lots of people there at the same time, there's a lot of movement, which can easily make people anxious. Besides, the lunch break is rather short, so if you want to do something more than eat during the break you have to hurry. (Girl, Year 8)*

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[1] The Swedish Education Act, 2010:800 requires that cost-free and nutritious school meals are provided for all students aged 7–16. For more information, see https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-school-food-policy-factsheet-sweden_en.pdf

Figure 5.
A place experienced as unsafe: The canteen (girl, Year 8).

The dining hall thus became an assemblage of furniture, restaurant equipment, different staff functions and students all flowing together in an intensive period of the day. It was also assumed that the organization and logistics worked well.

3.1.3 Quiet places for retreat

Students who felt unsafe in the school's crowded and busy corridors creatively sought out and appropriated places of retreat that were not necessarily designed for that purpose (see **Figure 6**). For example, some students took photos of the unused stairwells in the wings. One student wrote that:

> *I like spending time by the stairs on the top floor /.../ because it's quiet and my friends and I can be on our own there. We usually sit on the steps and listen to music and talk. As we have both long and short breaks, it's nice to chill out a bit in the longer breaks instead of sitting in the corridor, where it's often quite noisy, because there are usually lots of people in the corridor outside our own classroom. (Girl, Year 8)*

Other retreat places featured in the photos were corners with high-backed chairs or furniture that provided some sense of privacy, as well as furnished nooks and crannies. Thus, the furniture, the location, or both, helped to provide positive experiences.

> *I like it here. It's close to the science classroom and when there are no lessons it's quiet, which I enjoy. All the loud and rowdy people are not here. Most of the time I hang out with my friends, because that's the best. It's chaos in a corridor, which is really very tiresome. (Boy, Year 8)*

What became apparent in the students' digital stories was that during the breaks, some students experienced the noise and movement in the corridors and other common spaces and other sensory impressions as stressful. For this reason, they needed to seek out places of retreat where they could work quietly or talk with their friends (see **Figure** 7).

Figure 6.
A place experienced as safe: The stairwells (girl, Year 8).

Figure 7.
A place experienced as safe: A furnished nook near the science classrooms (boy, Year 8).

3.2 Spaces for learning

The students pointed to spaces such as breakout rooms connected to the class-room and teacher-centred pedagogies as positive, safe and contributing to enhanced

learning. Also, the indoor climate of temperature and light was important for how the pupils perceived the learning environment.

3.2.1 Silence

Several students talked about the importance of silence for feeling safe, as well as being a vital prerequisite for their study and learning in class. Most students regarded the classrooms as safe places, although they experienced insecurity and stress if the corridors outside the classrooms were noisy and crowded. "I can work well here and not be disturbed. I also feel safe because there is always a teacher nearby to call on if something happens. It's quiet here too and help is available if needed" (boy, Year 8).

It would therefore seem that the classrooms close to the central stairway are more exposed to noise than the more peripheral ones. This is partly a result of how the timetable regulates the flows of students between lessons in different parts of the building and partly due to the fact that there is only one central stairway in the building that the students are allowed to use. The classrooms in the wings are separated from the corridors by a small hallway, which means that there is less disturbance there due to less movement and noise.

3.2.2 Teacher-centred pedagogies and flexible learning environments

The students mostly described the science classrooms in a positive way. Science is one of the subjects in which students are taught in groups of 15, rather than 30. The quiet learning environment also added to the students' positive experiences of feeling safe (see **Figure 8**). The students commented positively on the science teachers' enforcement of classroom rules:

> *I like the science classrooms because it's always quiet there. There aren't so many people outside the classroom and we often divide ourselves up into two groups so that we have a lot of help and a good working atmosphere. For me that means that it's quiet enough for everyone to work undisturbed. (Boy, Year 8)*

Figure 8.
A place experienced as positive for learning: Science classroom (boy, Year 8).

Figure 9.
A place experienced as positive for learning: Breakout room (girl, Year 8).

What the example shows is that the school organizing and pedagogical practice match with the support of the teaching space.

Other places described as positive learning environments by both the boys and the girls were the smaller breakout rooms (see **Figure 9**).

> *I learn things better in the turquoise breakout room, because I can concentrate more easily when it's quiet. I've always been curious about everything that happens around me. In the classroom I can easily lose focus. Therefore, it can be nice to sit in a breakout room with fewer people than in a large classroom. (Girl, Year 8)*

Some of the students were very particular about the physical features that helped them to learn, such as the number and placement of windows and the temperature in the room. One boy in Year 9 wrote: "I've just chosen this place that works well for me. I feel very open and focused here due to the very nice windows, space and seating. It's very quiet here. In the physics lab you'd never suffer from heatstroke." The content and equipment in the science rooms offered activities with tactile features, where the artifacts seemed to stimulate the students' interest. It also became clear that some of the artifacts were dangerous and required teachers to be strict about what could and could not be done there. This was experienced by the students as contributing to their emotional safety.

4. Discussion

This chapter builds on a case study of how to create a sustainable and educational learning environment in a newly opened secondary school in Sweden. The purpose has been to enhance our understanding of how students view their learning environments, both inside and outside the classroom. Furthermore, the focus is on the students' experiences of safe and unsafe places, along with spaces that support or impede their learning. We used a theoretical model to study interaction in learning environments in order to facilitate an understanding of the school's practices and the connection between the physical spaces in the school buildings, how the school is

organized and its pedagogical praxis. The research design of asking the students to describe places in their school by using digital stories consisting of photos and stories opens up alternative ways of obtaining information and facilitating an in-depth understanding of how students perceive their learning environment.

The results show variations in the areas that students view as safe and unsafe and the reasons for this. It became clear that one area could be depicted as safe by one student and unsafe by another. The students also point to safe and unsafe places in the school buildings that the architects, interior designers and school staff have not fully considered in their original designs.

Regarding the physical space and school organizing dimensions, the results show that students gather in certain places, mostly due to the scheduling of breaks and lunchtimes, which points to the management of time as a co-creator of people flows [29]. For an in-depth understanding of learning environments, it is valuable to plan and test how the design of a school building works in relation to the timetable and the organization of the school and to create a staff culture that works in the spaces [10, 11]. The descriptions show how different spaces are used in unintended ways [36]. The significance of "taking place" as a materialized practice, where the movements and sounds of students influence other students, has been highlighted.

Here the results show that a high intensity of student movement and a low staff presence contribute to students perceiving different spaces as unsafe. This aligns with previous research [18] and can be interpreted as resulting from crowded and intense places due to the school's organizing and affordances in the physical spaces. For some students, the situation is experienced as stressful due to the overstimulation of bodily, visual and auditive sensations. Seeking out quiet and empty spaces to retreat to can be viewed as negotiating space to meet a need for retreat. The results thus show the value of creating retreat spaces for students. However, the appropriation of space seems to depend on the intensity and presence of adults, and here there is reason to consider the ways in which different groups of students are allowed to "take place". What kind of lessons are learned if some students continuously take centre stage, while others are left on the periphery?

Ricken [28] argues that the affordances offered by the physical space, the school organizing and the pedagogical practice create conditions for student agency and, by extension, students' learning experiences. The results here show that especially girls express discomfort in certain spaces and situations in the school building, and that they display agency by managing the situations in accordance with their perceived affordances of the building, organizing and praxis. In the light of these results, it would seem that the configuration of different spaces in school needs to be problematized and improved.

When it comes to the relation between physical space and pedagogical praxis, to the same extent that students describe the spaces they experience as unsafe and negative for learning, they also point to those that they experience as safe and positive for learning. The results show that smaller student groups and access to breakout rooms are appreciated by the students. In these environments, the teacher-centred pedagogy is most prevalent. We would like to highlight the tendencies that indicate that student-centred pedagogies create more movement and noisier environments, often as a result of poor acoustics [10, 11]. Achieving a match in an existing environment with new types of organizing and pedagogical praxis may either mean creating smaller groups to accommodate for the changes or remodeling to improve the acoustic quality. Failing to consider these factors may impact students' sense of safety, health and learning.

5. Conclusions

Studying a school and how to create a sustainable and educational learning environment has proven to be a rather complex endeavor. In this chapter, the focus has been on the students' experiences of safe and unsafe places, along with spaces that support or impede their learning.

How the learning environments are perceived by the students can be traced to the design of the physical space, the organizing of the school and the ways in which pedagogical praxis is expressed. The learning environment is perceived in varying ways, and there are variations in both the areas that the students viewed as safe and unsafe and the reasons for their choice of area. This means that one area can be depicted as safe or positive by one student, but unsafe or negative by another, which was also the case regarding places for learning.

From a potential safety perspective, it is possible to avoid ill-considered designs that create narrow passages and noisy spaces. In addition, flows of students and staff (i.e., the organizing) are crucial for how the flows play out during the school days. The school staff's task perception and practice are decisive for who, where, how and when the various staff functions match the physical space and the organizing. However, to create a sustainable and educational learning environment is still possible.

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Conflict of interest

The authors declare that they have no competing interests.

Author details

Anneli Frelin and Jan Grannäs*
Faculty of Education and Business Studies, University of Gävle, Gävle, Sweden

*Address all correspondence to: jan.grannas@hig.se

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Chapter 13

Transforming Elementary Mathematics Classroom Practice: Ideas and Innovation from a Leader's Perspective

Karim Medico Letwinsky and Michael Berry

Abstract

The purpose of this chapter is to highlight common challenges that school leaders encounter when seeking to implement change in the teaching and learning of mathematics at their schools. Specifically, the chapter will offer innovative ways that international elementary principals successfully have influenced systemic change in K-5 mathematics classroom practice. The challenges highlighted are not unique to international educators, but the context from which we speak is situated in the international educational environment. We offer practical, but theoretically based guidance for school leaders looking to implement, support, and sustain authentic change in the culture and practice surrounding the math development of students. The first half of the chapter will provide context and a situational perspective relative to the complex relationship between principals, as instructional leaders, and their ability to influence classroom change. Key events that have made conversations about the teaching and learning of mathematics prominent in schools around the world also are highlighted. The second half of the chapter details actionable ideas grounded in research that elementary principals or curriculum leaders can implement to help shift classroom teaching and learning at the elementary level. Ultimately, these shifts are designed to enable higher levels of mathematics achievement for all K-5 students.

Keywords: elementary mathematics, teacher education, pedagogy, leadership, professional development

1. Introduction

The process of leading change in a school, or any complex system, can be an elusive task. In fact, many theorists suggested that the vast majority of change efforts, despite the type of organization, end in failure [1–4]. In international schools, uniting a wide range of cultural beliefs about educational practice can be especially challenging. For instance, current best practice in teaching methods can clash with older, more traditional approaches experienced by parents or caregivers—a dilemma not unique to international schools. This places a natural divide between students'

learning process at school and the type of support students receive from caregivers at home—particularly related to mathematics [5]. Some cultures may continue to place significant value in more traditional teaching approaches including drill, practice, direct teaching style, timed testing, or memorization. Several of these methods have not only been proven ineffective or damaging for students, but they also are incongruent with the pedagogical practices required to shift mathematical understanding in a way that best prepares learners for the current global society. These complexities are not exclusive to international schools, but are a challenge for educational leadership teams in all environments.

One of the greatest challenges for school principals today may be supporting and sustaining teaching practices at the classroom level that demonstrate improved student learning, particularly in mathematics. The variables that contribute to influencing classroom practice are vast and include: the student, the teacher, curriculum, assessment, and student caregivers, just to name a few. The role of teacher and student beliefs about mathematics, past experiences, and potential anxiety are also prominent factors in determining classroom experiences [6]. What has become clear in the most innovative educational systems, however, is that the power to improve learning does not exist with an individual, but rather that a collective effort from whole school communities working together is required for successful change to happen [7].

This chapter will further explore the pressing need to change the way that elementary students engage with and use mathematics in the classroom. From the perspective of a primary school leader in Southeast Asia and a mathematics specialist working in both U.S. and international contexts, we offer innovative ideas that instructional leaders can implement in their efforts to transform the elementary mathematics teaching approach in their schools. The overall process is highly complex and interconnected with other influences not addressed in this work, such as curriculum or other external resources that support classroom practices. The focus here is on creative ways to unite the stakeholders of education and to bridge research and practice in support of transforming classroom pedagogy and learning experiences for elementary mathematics.

2. Time for change

The need for a transformation in how educators teach and students learn mathematics has been well established. Instructional leaders now are tasked with bringing a new vision of learning to life through the classroom experiences created for students. Since 1989, the National Council of Teachers of Mathematics (NCTM), an organization that the world looks to for research and guidance dedicated to improving mathematics education, has articulated a clear and comprehensive vision for mathematics in K-12 classrooms. Specifically, the organization has advocated for mathematical learning focused on an exploration of concepts rather than a more traditional learning environment that was teacher led, formula focused, and process driven [8, 9].

Another push for changes in mathematics teaching came from the extensive work of Professor J. Boaler [10]. Boaler heightened the debate for reformed teaching methods in her role as a Professor of Mathematics Education at Stanford University and the faculty director of Youcubed, an online platform of resources for parents and teachers focused on new and unique approaches to learning mathematics [11]. Boaler's work

highlighted the ineffective results of passive learning experiences in mathematics classrooms and the traumatic outcome for students who were taught mathematics as a series of disconnected methods and formulas to be memorized. Boaler's influence grew in 2016 with the book, "Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages, and Innovative Teaching." This time, Boaler drew attention to the dismal dispositions, inaccurate myths, and faulty perspectives that have long been associated with mathematics. This included topics like the influence of anxiety on student learning, the beliefs of teachers and students about their potential to learn mathematics at higher levels, student ability tracking, and the value of mindset and mistakes in the classroom.

A final urgency for change in mathematics teaching comes directly from the global community and society, at large. Reports regularly flood the news about the need for students with STEM (science, technology, engineering, and mathematics) specialty and interest [12]. The expanded availability of employment opportunities related to these areas of study is well represented in popular media and some researchers insist that mathematics in the context of STEM education demands focused attention in conversations and in classrooms [13, 14]. Reconceptualizing mathematics education is essential as the need to perform basic math skills is diminished with increased automation and technology capabilities [14].

General agreement exists about how little value a purely procedural approach to mathematics offers for today's highly complex world. In a school system at the core of instructional change is the role of the leader (i.e. elementary principal or curriculum leader) to inform and influence teaching at the classroom level. What any principal quickly learns in this effort, however, is that the process of implementing and sustaining change in teacher practice is anything but simple—especially for elementary mathematics.

2.1 Teaching mathematics

"Please take out a piece of paper and fold it in half hotdog style (vertically), rip it in half and give the other piece to a friend." Forty years ago, this is how our math class began each day. Once the paper was shared with a partner, each student numbered the paper 1–10. The teacher then called out multiplication fact questions at lightning speed as the students rushed to write down the answers. Once completed and corrected, the teacher read the list of student names and when your name was called, you reported aloud the number of questions answered correctly out of 10. Classes were filled with directives to memorize procedures using mnemonic devices such as Dracula's Mother Sucks Cold Blood (DMSCB—Divide, Multiply, Subtract, Check, and then Bring Down) for long division or Please Excuse My Dear Aunt Sally (PEMDAS) for the order of operations. Seldom, if at all, did mathematics lessons teach at the conceptual level. Rather, there was an abundance of worksheets for students to practice these mindless steps over and over again.

In many classrooms today, much of the same can be seen. Once, while visiting classrooms at an international school, we entered the room as the mathematics lesson was about to start. It began with students completing a multiplication fact worksheet as quickly as possible—now called "mad minutes" or some other anxiety provoking name. As we entered the class, one student immediately shrunk into his seat and stopped working. When students finished the worksheet, they were to call out "done" and the teacher would reply with their time which was then recorded. Students calling

out "done" one after the other began sounding like popcorn popping—the calls of "done… done… done" became more and more rapid each moment. As more students shouted out "done", the further the boy slid into his chair. Not different from many years ago, students then had to call out how many correct answers they had when the teacher called their name.

A teacher's approach to teaching mathematics is formed by range of influences. As a start, one might gain significant insight simply by asking a teacher some of the following questions: How did you learn mathematics in elementary school? Did your teacher encourage you to memorize facts and formulas or were you taught to seek understanding in the connections between mathematical concepts? Did you engage in math fact races that made you feel slow or not as good at math as your classmates? Perhaps you were taught that there is only one right way to solve a problem, often using a formula that you memorized so you could solve the next problem. This only worked, of course, if the *next* problem was exactly like the one you memorized.

These questions highlight some of the approaches that many teachers were exposed to as learners. Unfortunately, as research in teaching and learning continues to emerge, these very approaches are deemed some of the most ineffective and damaging ways for students to engage with mathematics. Yet, they remain familiar and comfortable for teachers who once endured them. If not adjusted in the elementary learning years, ineffective teaching methods will continue to turn students away from learning mathematics with more discouraged students sinking in their seats and dreading the moment their name is called. Such methods also will perpetuate gross misconceptions about what learning and exploring mathematics is about. For instance, these methods send messages to students that mathematics is about being right or wrong and solving problems fast, rather than thinking deeply, even slowly, about meaningful problems with multiple creative solutions.

Because elementary school is where foundational concepts, understandings, and attitudes are formed for students, we argue it is the most critical time in the learning continuum to examine practice continuously. Certainly, we do not suggest that a classroom teacher does not make every effort to offer the best possible learning opportunities for students. The reality is, however, that many teachers may have experienced learning in the manner described above—traditional, procedural, and disconnected from conceptual understanding. This incongruence in the way teachers learned and the way in which we are asking them to teach today can be a challenge to overcome [15, 16].

Necessary changes in mathematics teaching approaches are driven by societal needs for individuals who can apply creative mathematical thinking and current brain or educational research [10, 14]. None of these changes are simple and a comprehensive approach is necessary. Advancements in research related to the effective teaching of mathematics clearly point to the need for a balanced math class that incorporates both procedural and conceptual learning opportunities, presenting mathematics as a creative subject that requires reasoning and flexible thinking with interconnected concepts to be understood, not memorized. More specifically, students also need time to communicate mathematical understandings, explore concepts through inquiry, seek justification, and apply reasoning [8]. Often, this is contrary to the mostly procedural experiences many classroom teachers had as learners themselves, and therefore can be an unintended obstacle to their current classroom practice. Compounding this challenge is the reality that many parents and caregivers also have had traditional learning experiences with mathematics, and so they do not see the benefits to the desired classroom changes.

3. Taking action to transform mathematics teaching

Taking action in a way that can influence how teachers teach mathematics in their classrooms requires a sustained and integrated approach for change. In general, we identify three key areas that an instructional leader must attend to in order to have a positive and lasting influence on classroom practice. We broadly identify these areas as: (a) teacher development through external support, (b) informational and experiential parent development, (c) educating the whole math student. The process when executed is not linear, but rather each action occurs in a fluid and ongoing manner as the work progresses.

3.1 Teacher development through external support

The first step an instructional leader can take to influence a teacher's approach to teaching mathematics is to ensure targeted professional development. Critical to the success of the process is an authentic re-learning of elementary mathematics for teachers. The professional development, however, must be unlike traditional, less effective approaches, which may include a one-time trip to a conference or a brief visit by an outside professional consultant. The design and delivery must do more than demonstrate new classroom practices and strategies. Implementing a change in teacher practice requires a more comprehensive process than a momentary demonstration of a new method that a teacher then is expected to implement with success in their classroom.

3.1.1 Professional development models

When considering the use of professional development as a vehicle to influence teaching approach for mathematics, consideration of both content and delivery model is necessary. There are three common paths we have found international schools take when considering professional development delivery models. The first is teacher-directed model, sometimes in consultation with administration (curriculum coordinator or principal). This typically entails locating and attending a conference that presents information of interest. One issue with this brief injection approach, however, is that these topics often are fleeting ideas for practice and the desired change at the classroom level is not sustainable much past conference attendance. With this experience, a teacher's long-standing beliefs and experiences with mathematics remain the same.

The second model of professional development is more of an integrated and intentional approach to teacher improvement. In consultation with the administration, an identified area for improvement is noted for the teacher after numerous formal and informal observations. The opportunities for growth are addressed by having the teacher attend workshops or conferences with topics to improve the identified areas. We strongly recommend including the identified areas for growth as goals in the teacher's annual appraisal for consistency and clarity between the teacher and principal. This focused approach may help accentuate the desire to change, but often times the teacher's beliefs and past experiences with mathematics will once again overcome classroom practice.

A third approach to professional development most intended for a systemic change across the school is to employ an external professional consultant who will come to the school and work with both the administrators and teachers. Typically, the goal of

this model is to change a specific practice across the school (i.e. Grades K-5), rather than in one classroom only. Often, this will mandate a change in the school's teaching and learning philosophy, as well. The idea of redefining a collective philosophy is essential to achieve sustainable change because a school cannot focus on changing teaching practice only. The entire ethos of how the school believes students learn mathematics must evolve through this process. If this deeper philosophical change does not occur, once the key change agents within a school depart for other international jobs (a common phenomenon as international education is built upon a transient population), the change will not remain embedded within the school culture. A transformation in the overall school learning philosophy ensures that the teachers who come and go will have a clear vision of how the school engages in the teaching and learning of mathematics thereby promoting continuity even with turnover. This approach extends well beyond the decision to have an outside expert deliver lessons to teachers and administrators. Rather, the work with an external professional is only one piece of a multi-year, dynamic change process.

There are several benefits to deciding to have an external consultant work with the school community. The first is that by designating funds to an external resource, administrative teams convey messages of importance and value to the teachers. This is a rather strong message given the scarce nature of both time and money in most educational systems. Second, having all teachers and administrators in the building hear and experience the same learning opportunity together when the training occurs promotes consistency across the school. The conversations in the staffroom, classrooms, and offices around learning math now have a united purpose and focus because each individual experienced the same training as his or her colleagues. Third, although the consultant often is selected by the school's administrative team, ensuring that leadership teams (i.e. assistant principals, curriculum coordinators, grade level leaders, etc.) are involved in the selection process helps to gain buy in from all staff. Early conversations between all leadership teams and the external consultant makes it possible to customize the professional development experience. For example, asking the consultant to be aware of the school's mission, vision, and value statements help ensure that the content resonates with the teachers and is in alignment with the school's core philosophy.

3.2 Informational and experiential parent development

The triangular relationship between the student, parent, and teacher has long been proven valuable in promoting student achievement, in addition to positively influencing other variables such as student engagement or dropout rates [17, 18]. In classrooms, some educators refer to this as the triangular relationship that is essential for educators to effectively do their jobs. Others call it the triangle of trust or strength, noting the triangle as the strongest geometric shape, thereby creating the strongest potential for learning. Parent involvement can take many forms and may include activities such as attendance at school events like back to school night, parent-teacher meetings, volunteering in classrooms, or general school networking opportunities.

Most recently, research supports the benefits of including parents specifically and intentionally in their child's elementary mathematics education [19]. This is the dimension of parental involvement that we believe is critical to support classroom changes for mathematics. Unique to the new, desired learning environment for elementary mathematics are the significant differences in how students are taught math concepts as compared to how their parents or care givers were taught. For example,

the approach to teaching should emphasize strategic thinking and flexibility to support deep understanding of mathematical concepts, rather than repetitive practice or drills. This would allow students to use different strategies when adding, subtracting, multiplying or dividing, rather than a traditional algorithm. When asked to add 18 + 5, a student might choose to decompose the 5 into 2 + 3 as a first step. Then, by adding 2 to 18, the student makes the problem 20 + 3, summing to 23. In absence of proper communication with caregivers, this method can be unlearned if the student has work to complete at home and the parent reteaches a traditional algorithm. The next day, the student might now be saying, "to solve this problem I can drop a three and carry the one." Ironically, this is exactly what a teacher does not want to teach or reinforce, as it is strewn with misunderstandings of basic math concepts.

Creating and nurturing the relationships with parents to support these changes is not always easy. In any school, especially in international school systems, parent communication tends to be an area in need of continuous improvement. Some schools are trying to overcome parent-school communication challenges by inviting parents to campus to participate in a more engaging exchange about math teaching and learning, sometimes called Parent Coffee Mornings or the Parent Cafe. These are informational sessions designed to provide parents first-hand knowledge about a specific topic, and the leader of these parent sessions often is the elementary principal, curriculum coordinator, or an instructional coach. This personal exchange can be more effective than a newsletter to relay essential curricular information, but is limiting in its ability to support classroom change.

Adding more parental/caregiver engagement to these sessions can make them both informational and experiential, which we have found much more influential to support classroom change. In an interactive-station based model, teachers and/or students lead the sessions rather than being facilitated lecture style by the administration. This transforms the Parent Cafe from a passive listening session into an interactive and more experiential learning exchange. The interactive-station based model invites parents to actively participate in the sessions. Similar to the first information-only model, this design includes a keynote or general overview of the topics. This information then is followed by an activity that circulates parents through various stations led by students and teachers. Each station demonstrates an authentic example of the information shared where parents are not only observing the math activity, but are taking part. For instance, one station might be focused on games that support number sense, another for hands on activities to learn geometry concepts, and another using manipulatives to enhance the understanding of fractions.

An alternative informational and experiential model expands upon the station-based model by connecting the parent engagement directly to the classroom environment. This type of parent session lasts longer because there are deeper levels of interaction embedded into the experience. Similar to the previously described station-based model, the classroom-based interactive session includes an overview of the key ideas. This can take 30–45 min, during which time the curriculum leader can set the stage for the purpose of the school visit. Here, the theory behind the topic can be explored. For example, in a session focused on teaching mathematics through inquiry, the presenter would highlight how this learning strategy may look and feel nothing like how the parent community learned mathematics when growing up. The value of collaboration between students, a de-emphasis on rote and procedural teaching, and the detrimental effect that timed tests can have on children would be common topics discussed during the opening session. Describing to parents what inquiry mathematics looks like, feels like, and sounds like also would be essential topics.

The second half of the interactive classroom-based model includes parents visiting classrooms to see inquiry mathematics teaching in action. Empowered with some foundational knowledge about teaching mathematics through inquiry shared during the opening session, the parents have an opportunity to build a schema of inquiry mathematics teaching and then connect new learning in the context of the mathematics classroom. During classroom visits which last about 30–45 min, parents can note their key observations.

Finally, the parents reconvene with the session leader to reflect on the visit to the classrooms—a key step in the experiential learning process. This collective reflection allows parents to both reflect upon and regulate their prior beliefs about how learning mathematics should look and feel. Research has promoted such reflection as a means to support critical analysis in experiential learning [20]. Other studies also suggested that "Reflection can be as simple as asking questions such as, 'What just happened?' [21, 22]." When prompting parents to reflect on the classroom experience, we find parents genuinely excited by their observations. Statements such as, "I wish I was taught math like this!" and "It looked as if the students were having fun!" are common responses from the parent community.

A final, innovative way elementary principals engage parents in support of mathematics classroom transformation is to include parents in a new and unique learning experience in an effort to build collective efficacy. Almost 50 years ago, A. Bandura noted that if a group had great confidence in its abilities, the group also experienced great success [23]. Collective efficacy has been defined as "the perceptions of teachers in a school that the efforts of the faculty as a whole will have a positive effect on students [24]." In the educational setting, research on the concept of collective efficacy has examined the relationships between teachers' collective efficacy and student achievement, finding that collective efficacy can be more important in explaining school achievement than socioeconomic status [25].

Extending the potential reach of collective efficacy, Bandura suggested that collective teacher efficacy can also have a positive influence on parent-teacher relationships [23]. In this final experiential model for parent development, the principal capitalizes on the powerful concepts of experiential learning, collective efficacy, and reflection. If we suggest that a strong triangular relationship is beneficial to student achievement, why not incorporate a process to build collective efficacy between the critical stakeholders to classroom learning: teachers, parents, and students? This model also removes the administrators, teachers, or students as the messengers for new information, and connects parents directly to mathematics teaching experts and research.

J. Boaler, the professor previously mentioned from Stanford University and director of the webpage, Youcubed, has created a number of online courses to support both teachers and parents. One self-paced course entitled, "How to Learn Math for Teachers" requires participants to, "Explore the new research ideas on mathematics learning and student mindsets that can transform students' experiences with math [11]." The website further explains that, "Whether you are a teacher preparing to implement the new State Standards, a parent wanting to give your children the best math start in life, an administrator wanting to know ways to encourage math teachers or another helper of math learners, this course will help you [11]."

Believing in the potential for a broader sense of collective efficacy, one school we encountered used Boaler's online course to create a more extensive but inclusive learning community to support a comprehensive transformation in mathematics teaching. The process began by encouraging elementary teachers, administrators, and parents to enroll in the online course offered by Youcubed. When the course began,

35 teachers and administrators and more than 50 parents embarked on the learning journey together. Upon conclusion of the online course, the principal hosted reflection meetings for all participants to discuss the learning experience and the influence it had on their beliefs about how to teach mathematics, how to help students persist with learning mathematics, and what a meaningful demonstration of understanding mathematics should include.

Elementary principals who have used this approach reported that the knowledge gained during the online course was highly impactful for all participants. The course material provided classroom teachers the motivation to persist with the implementation of new strategies for teaching elementary mathematics from previous professional development sessions. The information provided parents the explanations and demonstrations needed to reduce resistance from home to classroom changes in learning mathematics. The experience also afforded parents a new understanding for how to support their children from home in their math learning journey by not only sending positive learning messages, but also by resisting the urge to regress students back to the traditional or procedural methods learned by parents in the past. The online course experience also helped administrators understand how to best support teachers in the effort to shift the teaching and learning trajectory for elementary mathematics throughout the school.

3.3 Educating the whole math student

Familiar phrases that teachers hear often in their mathematics classes are, "I'm not good at math" or "I'm not a math person." These phrases have provided excuses for decades to students who have decided to disengage with this subject [26]. Sadly, when this sentiment is expressed in the presence of a parent, longstanding math anxiety for parents may result in a response such as, "Don't worry, I was never very good at math either" [27]. For some reason, this statement is accepted as opposed to, "I was never very good at reading," something seldom heard among adults or children. Our willingness to accept these excuses for mathematics over the years has contributed to the low achievement of students in this subject, as well as the perpetuation of negative attitudes that surround mathematics.

An individual's attitudes about learning mathematics are formed by prior experiences which often included damaging teaching methods like drill, speed, and practice without purpose. If teaching focuses on the procedures of mathematics but is vacant of deeper conceptual understandings, the results are superficial understandings of topics. These limited understandings allow students to conclude that they are not very good at math, when really what they lack is deeper understanding. The reality is that students never actually learned the content in the first place. The pervasive avoidance of engaging deeply with mathematics prevents adults and students, alike, from seeing mathematics as a subject of value to be understood, rather than avoided. To counteract the "I'm not good at math" syndrome, we believe it is essential for teachers to attend to not only the conceptual learning process of mathematics, but also to break the cycle of bad math attitudes by cultivating the necessary habits of mind for success.

Some of the essential habits of mind that teachers must develop with students include the value of making mistakes and willingness to engage in a productive struggle in mathematics class. The process of learning math is messy and unpredictable [28]. Students should expect to engage in trial and error that includes making mistakes and then trying again... and again. If this mindset is considered the norm,

then learning mathematics becomes more like a stream that flows naturally from mistake to mistake [29], and less like a final destination with one right answer. Teaching methods that focus on speed or right answers only send messages to students that make them feel incompetent when a solution is incorrect or when the student needs to work slowly. There are many students we have encountered like the young boy in the previous example who could not work as quickly as peers, and so they slowly shut down to the possibility of feeling accomplished with mathematics. When teachers ask questions that allow for multiple pathways and creative thinking, students have a chance to engage with the class and with the content. At the same time, teachers must give ample time for students to contemplate questions deeply, rather than answer quickly from memory. In doing this, teachers also send messages that thinking, wondering, and persisting is valued in mathematics, not answering correctly or quickly.

Closely related to welcoming mistakes as a part of learning mathematics and not a part of failing to excel in mathematics, is the value of productive struggle. Piaget noted the essential role of disequilibrium or cognitive conflict in order to advance in levels of cognitive sophistication [30]. This struggle or imbalance plays an important role in the learning process during mathematics class. Misconceptions about how easy or difficult learning mathematics should be may increase a student's negative response to struggling. Teachers must actively inform children that struggling is not unique to students who do not excel in math, but more importantly, that struggling is an essential part of the process for all who learn math. This important shift in how students perceive the struggle in mathematics class is another way that teachers can be sure to educate the whole student in math class. The educational process must not only focus on the mathematics content, but also on the students' beliefs and attitudes about what learning mathematics should be. At times, learning will feel difficult and mistakes will happen. These are no longer exceptions that apply to less capable students, but rather *expectations* for all students.

4. Finding success by understanding change

Designing, initiating, and implementing change in any institution is difficult. Anyone who has tried also knows that sustaining change over time is even more challenging. Schools extend large amounts of money, time, and energy to initiate change processes throughout a school system. Often times when the effort is intended to influence teacher practice, it is not long before teachers revert back to the way things were done before the implemented change took hold. This is not an act of defiance or even intentional resistance, but the reality is that teachers feel most comfortable teaching the same way they were taught. Breaking this cycle is an intricate and involved process. Even the most accomplished teachers who have successfully transformed their approach to mathematics teaching report that they must continuously challenge themselves and reflect upon their lessons to ensure fidelity with the new desired appraoch.

In the United States over the past 20 years, ongoing public awareness campaigns have encouraged parents to read to their children, increase access to books, or revise classroom learning to promote literacy. At the same time, mathematics initiatives have not had the ability to gain the same traction [31]. Global assessment statistics would support a similar phenomenon in mathematics throughout the world. When examining the influences related to our understanding of and interaction with mathematics, however, one quickly realizes how complex affecting change can be. Compounding

these challenges, a nationwide survey conducted in the United States also found that parents generally find math and science less important in their children's lives than reading [32].

The question that remains is: what can school leaders do to ensure that a desired change is institutionalized? Elementary principals who have found success in this process take time to revisit the effort and the progress continuously. In their book Implementing Change: Patterns, Principles, and Potholes, G. E. Hall and S.M. Hord remind us that change is a process, not an event [7]. Effective instructional leaders take time to remind themselves and their stakeholders why a change was important. Revisiting an initiative with this mindset allows for the cycle of continuous improvement to occur, as leaders re-evaluate the "why" of this work.

Some elementary principals claim that success requires making time for staff meetings every 6–8 weeks to discuss what has gone well and what challenges continue to exist. Continuous reflection contributes positively to the effort over time, and assigning a small task or challenge in between meetings can keep teachers active in the change process. Examples of this might include: conducting a lesson using one of the new classroom strategies and reflecting on the successes or difficulties of the lesson; conducting a peer observation and then reflecting together on the lesson's outcomes; or inviting someone to observe your class to offer perspective on your application of a new classroom strategy.

Teachers have reported that when making efforts to change their classroom practice, having time to observe and collaborate with their peers is extremely helpful. This can pose an additional challenge for leaders because organizing class coverage for teachers to visit other rooms during the day can be challenging, as resources for this purpose are scarce in many buildings. Principals or curriculum leaders who are willing to cover classes for teachers or hire substitutes teachers to enable peer observations and collaboration demonstrate a strong commitment to teacher success in the change effort. As an alternative, some teachers choose to video themselves teaching a lesson which allows for personal reflection and self-assessment.

Elementary principals warn: do not forget to celebrate the small successes. Recognition and celebration of progress is a key part of the change movement's momentum. This positive energy may also help shift lingering resistance. There will be times when teachers may not be successful in achieving the desired changes, however positive reinforcement for their attempts is important. A truly innovative process includes both success and failure as we learn important information from each of these experiences. Elementary principals also warn that there will be some teachers who may never feel comfortable with changing their math classroom practice. They can be found in almost every school in the world—plan for these teachers. They will need more support and encouragement to be successful. Facilitating change must be viewed as a continuous, supportive cycle grounded in a team approach.

4.1 A model for change

A final trait we attribute to the most innovative instructional leaders is a keen awareness of the essential elements to a successful change process. Framing the approach to influence classroom practice in a way that aligns with general principles for change significantly increases the potential for success. For example, one principal reported that maintaining focus on Kotter's 8-Step Change Model helped in the overall effort to create and sustain authentic change in math classroom practice [1]. These eight stages include:

- Establish Sense of Urgency

- Form a Powerful Guiding Coalition

- Create a Vision

- Communicate the Vision

- Empower Others to Act on the Vision

- Plan for and Create Short-Term Wins

- Consolidate Improvements and Produce More Change

- Institutionalize New Approaches

When reviewing the practices detailed in this chapter, alignment to these stages articulated by Kotter are apparent, as the goal of our work has been to unite theory and practice in new and meaningful ways. The execution of the strategies described in this chapter offer multiple entry points for leaders to infuse the stages of Kotter's model into the change process of classroom teaching. Essential to the overall process is to identify and measure key variables along the way in order to demonstrate success with authentic data. This information offers the opportunity to celebrate demonstrated success and keep the process moving forward. Principals who use this strategy found that data revealing success along the way provides motivation for teachers, parents, and administrators to keep going. Although discussing the systems that gather data will not be addressed in this chapter, it is important to note that quantitative data (including external and internal benchmarks or assessment) as well as qualitative data (observations, anecdotal notes, etc.) are all valid examples of collected data.

5. Discussion

The overarching goal of this work was to reimagine the concept of professional development and to present a new model for achieving classroom level change in elementary mathematics practice. This work evolved over 6 years and within the walls of over a dozen international schools seeking ways to provide the best learning opportunities for students in mathematics, while recognizing changes in instruction at the classroom level were necessary. A leader's primary role in any school and in every context is to work within the school community to elevate the achievement of students. Supporting a reform in classroom instruction is key to changing the success trajectory for students in mathematics. By taking a leadership lens in an international school environment, this work provides multiple creative solutions for a range of obstacles not unique to the international environment.

In international schools, the complexity of implementing change can be considerably more difficult because of some environmental and situational realities of these schools. For instance, teachers and leaders in international schools are often expatriates of the host country and move on to different schools in different countries within 3–5 years. This transience is an expected part of the international school community, yet the impact on the stability of the schools, and specifically

the consistency of educational delivery, can make consistent year to year operations a challenge. Given this dynamic, sustainable change can be difficult when the initiators of the process may not have a role in the implementation or institutionalization of the desired change.

For a school principal whose primary responsibility is the oversight of instructional practice, these obstacles are concerning because they can directly interfere with student learning. At one time, the principal served predominantly as an administrator focused mostly on managerial duties. In recent years, however, the role of the principal has shifted to more of an instructional leader where the principal is deeply involved in setting learning goals, evaluating teachers, identifying and allocating instructional resources, and managing the curriculum that guides classroom learning [33]. Most international school principals seek a balance between their manager-administrator duties and their role as an instructional leader. As an instructional leader, the principal places the highest priority on instructional quality and works directly with teachers to bring to life a vision excellence in every classroom.

Effective principals who make student learning the nucleus of their work recognize the tremendous push for improving student math outcomes within their schools. Rapid changes in our global society require educators to reconsider how we design and deliver the most relevant learning experiences for students. Reports on international student assessments such the Organization for Economic Cooperation and Development's (OECD) Programme for International Student Assessment (PISA), allow the world to internationally compare educational achievement. This has placed a new focus on the quality of education across systems, cultures, and countries. The reports have spot-lighted educational quality for all who are watching to determine which countries are successful in this pursuit of learning excellence, and which ones are not. The range of differences revealed in these reports has made educational reform a high priority for almost every country in the world.

Proficiency and literacy in mathematics now extends beyond correct answers or a cursory understanding of mathematical concepts. Today's world demands the creative use of these ideas and the ability to communicate mathematical thoughts clearly to others. Rather than providing one right answer produced by a learned formula, a true demonstration of mathematics literacy requires the ability to provide several different pathways to a right answer or at times, several different possible answers. This requires command of traditional mathematics, a sophisticated use of the language of mathematics, and a deeper understanding of concepts. These necessary skills turn the mathematics learning process into something much different from the passive classrooms of the past where mathematics was procedurally driven and memorized for success.

6. Conclusions

It has been our privilege over the years to work with teachers and leaders to help influence change in how students engage with elementary mathematics. We have found the process of change to unpredictable and nonlinear. Despite the challenges, we insist that the time to change is now. The most successful and innovative curriculum leaders have applied the ideas shared in this chapter or some combination that is most suited to each school's unique culture and climate. Seldom is success achieved without attending to the overarching theme—instructional practice reform is more complex than an expressed desire to make changes in day-to-day teaching.

As illustrated here, the effort to transform mathematics classroom teaching is complex and multifaceted. Facilitating and sustaining such change is a team effort supported by an engaged community.

To achieve sustainable change in classroom practice, we further suggest that leaders maintain a keen awareness of the stages of change. Many professional development models that schools employ are not successful for various reasons including poor planning, not obtaining buy-in from stakeholders, or not following through with important steps to ensure that a lasting change takes hold. However, by implementing a PD model that is targeted and purposeful, such as the one described here, change initiatives can be successful. We recommend that a comprehensive plan must include: (a) teacher development through external support, (b) informational and experiential parent development, and (c) educating the whole math student. At the same time, leaders must be mindful of the stages of change and a reliable change model. Through this process, we have found that elementary teachers can realize they did not have to be "good math students" in their youth to become great math teachers today. Similarly, parents and administrators can learn actionable ways to support our children in becoming engaged and enthusiastic math learners for life.

Notes/thanks/other declarations

We want to express our sincere admiration and appreciation for all of the change agents—teachers, leaders, and caregivers alike—who work every day to ensure positive learning experiences in mathematics for children of all ages. There is no more complex work than the work of a teacher. We especially are grateful to those who welcomed us into their schools, classrooms, and families in an effort to grow and learn together as a community of math-minded enthusiasts.

Author details
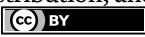
Karim Medico Letwinsky[1][*] and Michael Berry[2]

1 Wilkes University, Wilkes-Barre, Pennsylvania, United States

2 Bandung Independent School, Bandung, West Java, Indonesia

*Address all correspondence to: karim.letwinsky@wilkes.edu

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Illustrative Techniques in the Primary School

Cestmir Serafin

Abstract

The goal of this chapter is to contribute to the area of teaching about technology, especially by using illustrative aids, kits as didactic training tools in contemporary schools, and to define what is required by this field in view of the goals of the teaching process, especially of the education theory. The study summarises the issue of illustrative aids, from the view of their application to the area of general training, and formulates answers to some related practical issues of the relevant subject didactics. The chapter presents the results of past research surveys which were conducted in relation to incorporating illustrative aids - kits into education, and of the effectiveness of the implemented education in the practical reality of teaching. One subject of discussion also includes the condition/the current state of implementing education in the primary school environment. The aim of this chapter is to provide a comparative and analytical insight into the teaching of general technical subjects in primary schools in the context of technical kits, defining current trends and approaches to the implementation of educational activities. The broader intention is thus to contribute to the development of a sectoral didactics of technical subjects, targeted at lower school levels and educational practice.

Keywords: Illustrative techniques, illustrative aids, kits, education, primary school, didactics, subject didactic, electronics

1. Introduction

Combining physical and mental activities as a prerequisite for a well-rounded personal development – that is the benefit of technical kits, electronic ones especially. Such combination also pushes the limits of the pupils' efficiency. When used correctly, the creativity of pupils a superior developmental level of knowledge in terms of quality.

This process is also facilitated by innovations related to other scientific fields, such as cybernetics, system and information theory, ergonomics, bionics, developmental, social, and educational psychology etc. [1].

Technical kits in general have many positive effects in school education and appropriately complement and support this education. It can also be said that kits are also one of the subjects taught. If we look at the global growth of information technology, then we also see the need for growth in the integration of these technologies with kit

sets, and where else is this more appropriate than in teaching. This process of linking is also aided by the digitalisation that is now being pushed into children's education from kindergarten onwards. We can question whether this is a good thing or not. Many experts are in favour, others the opposite, but technological progress is part of the progress of mankind and will not pass us by. Therefore, these realities are necessary stimuli for the development of education, its theory and practice.

From the point of view of schools, the immateriality of electrical engineering as well as the materiality of technology and engineering pose a challenge for the design of educational programmes and for the relevant chapters in textbooks and methodological manuals dealing with it. In these cases, the curriculum is demanding of experiments that require the presence of technical equipment in schools. It is therefore important to stress the importance of material and didactic teaching aids, which certainly include building blocks as part of the technical facilities and schools and education in general.

2. Technics and education

In the current Czech education system, the concept of technology is interpreted as a matter of general vocational training and applied to it. In view of this, it is necessary to assume a corresponding approach to interpreting pedagogical rules and principles as they pertain to using kits.

The term *technics* (derived from the Greek word *tékhnē* – knowledge, craftsmanship) describes a vast, complex, hard-to-delineate part of the world we inhabit [2]. Thus, it is rather difficult to formulate its clear definition. It all depends on one's specific approach to science and philosophy. This problem is felt not only in Czech scientific circles, but also abroad – the works of W. Walat [3], O. Autio and R. Hansen [4], or A. Williams and J. Williams [5], as well as many others, can be mentioned as an example. There are usually two approaches to teaching subjects with a technical focus. According to J. Kropáč [6], W. Walat [3], the substance of the term in regard to teaching technical subjects can be expressed in two ways:

- *technics* as a set of tools that are artificially created by and for the benefit of man, and also as a set of methods and procedures used in their creation, use and disposal. However, this concept has one major drawback, namely the need to distinguish between two related aspects - in a narrower sense (the set of man-made tools) and in a broader sense (the processes of using man-made tools, resources, energy, etc.);

- *technics* refers to collections of tangible, purpose-made objects and intangible substances created by human activity. The way in which an activity is carried out is called technology. Both the concepts of technique and technology are then part of the technosphere - the man-made environment. This notion is based primarily on the work of J. Stoff [7] and has recently greatly influenced attitudes towards education, especially through the notion associated with constructivism.

It is understandable that technics is a social phenomenon since it, along with nature and society, creates and shapes human environment. According to J. Kropáč [6] whose works pick up on those by H. Wolffgramm [8, 9], technics has certain specifics which can be described as manifestations of its rules:

1. The unity of natural and social forces in technology - the basis is a technical object, system or process that is based on natural phenomena and rules.

2. Determination of technology - technology is a tool for achieving goals, it has a relationship to the goal as a means.

3. Technology is complex in nature - it is actually the result of the interplay of many natural, technical and social rules.

4. Plurality of technical solutions - usually the solution is not always obvious due to many external influences.

The use of technics is associated with the development of human societies and of social, intellectual, and physical skills of individuals. Thus, technics becomes a necessary part of solving the various situations and problems life brings. Schools, of course, react to this – by introducing vocational training into the education system, though this term is nowadays used in the figurative sense (practical activities, work guidance, the work world, etc.).

Traditionally, pedagogy has divided guidance into components (intellectual, moral, aesthetic, physical, and work ones) whose content addresses the interim goals of pedagogy (see K. Kohout [10] or A. Quinn [11], among others, for more details). These components include *work guidance* which can be understood as a framework for establishing a relationship to work and for acquiring general technical knowledge, skills, and habits [2, 12]. It is implemented by the practical focus of school subjects, by field trips, and leisure activities. Because work guidance deals with acquiring general technical knowledge, the term *technical guidance* is introduced.

According to J. Stoffa [7], vocational training can be viewed as a systematic controlled process of intentionally shaping one's personality as it relates to technics, in a way that makes sure that the person being educated has a correct attitude to technics and its use in their own life (a creation of the so-called technical literacy). These goals must be met on a scientific basis, consciously, and in the course of activities related to the technics which each person encounters as a part of their daily life, i.e. technics that may have an effect on the life of the person being educated. The content of this term lies in our understanding of the connections between technics, society, and nature. Therefore, the content of vocational training is rather universal and includes a wide range of technics as well as related activities.

By implementing vocational training, the following is created [6]:

- knowledge of technics, its production and use;

- proficiency, habits, and skills in regard to carrying out activities related to technics;

- creative proficiency and skills in working with technics;

- positive relationship and attitude to technics and activities related to it.

Therefore, let us talk about vocational training in the broadest sense of the term. This does not mean a specialised vocational training which results in occupational qualifications, but a vocational training whose aim is to establish technical literacy [2, 12].

T. Kozík and M. Kožuchová [13] establish three elementary areas as the basis of technical literacy:

1. attitudinal – to understand the role of technics in society (to understand different aspects of technics), namely in view of these types of relationships:

   a. economic;

   b. environmental;

   c. social;

   d. aesthetic;

   e. moral;

2. content:

   a. awareness of technical terms and processes;

   b. using technical tools;

3. procedural – mastering the methods and system of scientific research.

The term *technical literacy* is also defined in the work of Z. Friedmann [14], as follows:

- Acquiring concepts, knowledge of technology and technical materials and acquiring technical skills, creativity;

- the ability to solve technical problems;

- developing an intellectual relationship with technology;

- understanding the relationship between science and technology and acquiring the skills to apply it;

- development of technical creative thinking.

I. Škára [15] talks about the process of basic education, the aim of which should be, among other things, the creation of so-called technical literacy, which:

- allows pupils to recognise the aim and purpose of technics and technical activities;

- helps encourage and develop pupils' psychological potential and manual skills;

- equips pupils with a system of basic technical knowledge and skills;

- introduces pupils to technical professions, helping them make decisions in regard to their entering into social practice.

Based on the areas of technical literacy formulated above, we can observe that the acquired technical knowledge helps pupils to correctly get their bearings, especially in situations where they encounter technics or a technical object and become its users. However, the knowledge also helps them in situations where they have to solve issues which result from the failing functionalities of technical devices–objects, or if they themselves would like to create an adequately challenging technical object or are supposed to take part in its creation. This concerns knowledge of technics as a part of human culture, of its importance for humanity, and subsequently knowledge gained from key technical fields – especially disciplines which deal with technical materials; the technology of materials; technical graphics; studying machinery as well as its components and mechanisms; electrical engineering and electronics; and last but not least studying cybernetics as well as information and communication technologies.

3. Technical thinking

Technical thinking and its development is a fundamental goal and prerequisite for teaching technically oriented subjects, regardless of their specific focus. The Polish psychologist E. Franus [16] analysed the concept of "*technical thinking*" and states: "*Technical thinking is the process of reflecting and using physical laws as well as technical principles in technical creation and technological processes.*" We can say that this definition quite accurately defines two interrelated aspects related to technical thinking - cognitive processes with a predominantly analytical character, and creative processes, or also design processes, in which synthesis predominates.

These stated aspects of technical thinking could and should also be taken into account in the design and development of experimental activities included in technical subjects. When we talk about experimentation in these subjects, the logic and focus of cognitive processes is very similar to the cognitive processes resulting from play, but we must of course respect the wider social (psychological economic, etc.), natural (physical) and also technical context from a teaching perspective, which makes the actual abstraction rather difficult. In teaching practice, we often see trends in experimentation in technology that are based on natural science experiments, inspired by them in the form of experiments in the sense of an exploratory approach. These approaches have been published in their studies, for example, by D. Nezvalová [17], M. Papáček [18], J. Dostál [19] and others. It is not always beneficial, but what is indisputable is that these experiments apply a constructivist approach in teaching, which makes them positive for the student and the teacher. Pupils are put in the role of "scientists and researchers" - based on situations motivated by the teacher - pupils ask questions, look for evidence, formulate their explanations based on the evidence they arrive at, evaluate, communicate and verify [17].

What has now been stated is fully applicable to the questions connected with experimentation in technical subjects, but this experimentation cannot be complete if it merely promotes cognitive activity of a scientific character without revealing basic and general technical contexts, phenomena and relationships. In experimentation, the pupil's thought-creation and design processes (which form the second part of technical thinking) are combined with activities, situations, products and outputs that are concrete and real in their content. Thus, we can say that there is actually an application of the synthesis of the acquired knowledge to a new level to a "new quality of solution" (of course from the pupil's point of view) and thus also to its experimental verification. Understandably, in this case, the situations induced by the teacher

should include to a reasonable extent the different phases of the life of the technical device (design, construction, programming, production ....), including the environmental issues related to the disposal of the product [20].

The purpose of teaching technical subjects, i.e. subjects oriented towards technology, should be to encompass the pupil's cognitive activities and his creative processes, similarly to the solution of educational situations. These cognitive and creative activities are, after all, an integral part of meeting the legitimate needs of an individual or even a group, even in the context of creating, using, handling technology.

Man has placed between himself and nature an artificial environment, a material culture, by which he influences nature and which influences himself. Humans thus change and shape their environment, primarily through technology. At the same time, however, they also search for, discover, create, improve and extend this environment. These circumstances bring with them specific approaches, practices and methods of thinking precisely in relation to the technology that is conditioned by it.

As man, nature and the world change, so does the approach to education, and the shape of the school is changing, placing more and more emphasis on activity, experience, self-knowledge in creative activity, both mental and manual (unfortunately less so). It is essential to reinforce this concept, including in the preparation of those who will one day be teachers, because only in this direction can they be profiled for their future profession of teaching. The starting point in the concept of didactics of teaching subjects is therefore a critical analysis of the current concept of didactics in relation to the needs of teaching practice by assessing the level, quality and necessity of the competences acquired by pupils for their application in life.

An important part of the didacticism of technical subjects is the inherent concept of *technical thinking* and the method of its development in teaching. At present, the focus is mainly on the notion of creativity or *technical creativity*. As mentioned above, technical thinking is a specific form of thinking, a term with broadly defined content. In our view, a student's technical thinking is defined in the context of the concept of technical literacy (for example, the work of J. Kropáč [6]). The specifics of technical thinking are based on the nature of technology, where one of the key specifics is the uninterrupted continuity of theoretical and practical components, as well as the relationship between means and ends, or the determination of which means should be used to achieve a goal. Another fundamental aspect of technology and thinking is important here - complexity, because no significant context, whether technical or non-technical, can be ignored when working with technical equipment. It is also clear that different means can be used to achieve a goal or fulfil a purpose. In this case, we are confirmed by the need for critical and evaluative thinking.

Technical thinking includes operations such as analysis, synthesis, classification as well as analogies, abstractions and concretions [21]. In a context with a technical imagination, it is generally an analysis of a product, a concept, an activation of existing skills, knowledge and experience that can be used to address issues of construction and creation, and then a synthesis of all applicable realities by which we create a reality, i.e. arrive at a complete solution of design and product creation. In this context, we cite the work of the eminent Polish psychologist E. Franuse [16], which defines technical thinking as *a process that reflects and uses physical laws and technical principles in technical subjects and technological processes* [16].

German authors B. Hill and B. Meier [22] define technical thinking as a mediated and generalised reflection of reality, which is characterised and predetermined by a close relationship between the conceptual, visual and practical components of activities with technology. Thus, it is indisputable that technical thinking has cognitive and

creative content, which are composed of thought operations with ideal reflections of objective reality. One of the characteristic features of this technical thinking, then, is the inclusion not only of existing completely objective reality, but also of possibilities based on socialisation, social cognition. These realities can take different degrees and forms - from the creation of completely new objects (procedures) to the improvement of these objects (procedures) or the search for errors and failures.

According to L. Tondel [23], the above shows that technical thinking actually has two interrelated aspects:

- cognitive aspect - an activity in which we learn about the structure and function of new technical creations, their drawings. This aspect also occurs during assembly and disassembly (activity of an analytical nature);

- design (creative) aspect - a mental process that is focused on creative activities (designing, inventing, improving) or on solving technical processes and tasks (activity of a synthetic nature).

Both of these aspects are manifested in relation to technical construction kits, as both the cognitive and creative aspects are an integral part of the activities associated with any kit.

In problem solving, cognitive thinking always has an auxiliary function in preparing the intellect for creative synthesis. Thus, we can say that creative thinking is related to the actual "content" of cognitive thinking, and both processes play an important, determining role in problem solving. If analysis is a fundamental attribute of cognitive processes in science and technology, and synthesis is a characteristic of creative processes, then there is a psychological barrier between cognitive and creative processes that occur simultaneously in thinking and yet separately in both scientific and technical thinking. However, it is a permeable barrier that divides the thinking process into a cognitive, analytical part and a creative, constructive part. This permeable barrier is a kind of Rubicon that we cross in our thinking, whether intentionally or unintentionally, to reach a higher level, a new quality. This then occurs when our thinking process gathers enough information and thought (productive content) to transform quantity into quality (according to the laws of dialectics). However, even then, this new quality still requires a "supply" of details, but at the same time it also already offers a hint of a solution to the problem. Therefore, the barrier mentioned above is also a symbol of a kind of transition from analysis to synthesis, from the cognitive process to the creative process, from quantity to quality, from discovery to action. The question of transition is therefore a question of fulfilling the necessary conditions for solving the problem.

According to Franus [16], problem-solving thinking can be twofold:

- with a homogeneous structure of a purely cognitive type, in the case where it is a non-productive process that is limited by knowledge of the content of the problem and does not lead to the solution of a new problem;

- with a dual structure, i.e. with a cognitive and creative aspect and a productive outcome.

In solving a difficult problem, intellectual work does not follow a simple model (nor does it copy that simple model), but involves many synthetic micro-parts

(microsyntheses) that form the final creative macrosynthetic complex. In addition to this complex, in multicomponent cases, the mental-cognitive creative or design structure also forms a "mosaic" of multiple microsynthetic parts.

Technical thinking, like any other type of creative thinking, is not only cognitive thinking but also a two-valued complex process that respects both simple and complex problems, as well as the structures of microsyntheses and macrosyntheses mentioned above.

In scientific thinking, creative synthesis is at the core of formulating theories within a research problem, but in technology it is at the core of finding as well as inventing and creating the structures of technical objects. In both cases, however, these are concrete or particularised (object) processes of so-called creative thinking. The quality of these processes, however, understandably differs considerably. However, both develop in the realm of concepts and ideas, which involve the form of words and sentences and then also require representation and concrete material substance.

Cognitive thinking performs various functions during the creative and analytical processes. In science, it is a research process that prepares the information needed to formulate a theory, or it can be a cognitive process that facilitates familiarity with the content of the problems to be solved. In technology, this concerns at least four general situations, namely, the provision of information to learn about the content of the problem, the learning of theories of science, technological principles and laws and rules in relation to the problem, the investigation of production processes and, last but not least, the investigation of the activities of the final product or object. In each of these situations, the result of knowledge is an act of creative synthesis as a key element for the completion of the creative process.

According to E. Franus [16], technical thinking, which is actually a concretized process, differs from other concretized processes in that it is concerned with the creation of an artificial world and the construction of technologies and objects in the broadest sense. However, with regard to the procedural and psychological aspects, this process is also characterised by a typically dual cognitive and creative structure (just like other concretized processes, for example, musical or artistic processes, etc.). Thus, it can be said that the key to cognition and creation is the procedural structure of thinking, which includes both the cognitive phase in analysis and the creative phase in synthesis (both are also closely related to the technical and constructional building blocks that connect these areas or phases). If we look at the content, then concretised technical thinking refers to a particular form of matter (substance) and therefore to a given technology or technique in the sense of an object. The various forms of matter (substance) and production technologies, methods and operations, also the results and works of the human intellect then constitute the concrete specifics of this concretised thinking. The same matter (substance), albeit in different forms and shapes and using different methods, has been and is the subject of study in different disciplines and also of description in different theories. Thus, specifically oriented concrete thinking manifests itself in all the sometimes hard-to-believe diverse forms of activity that we call creative.

Technical thinking, its content, is a broadly defined concept that can be divided according to different aspects. Indeed, the above text shows this in a way. According to E. Blomdahl and W. Rogal [24], E. Franus [16] also distinguishes four types of technical thinking, which, in our opinion, are also fully manifested in relation to construction and technically oriented building blocks:

- Visual thinking and reproductive thinking involving, for example, reading technical drawings;

- intuitive thinking, leading to the improvement of existing designs or even to the creation of new ones;

- conceptual thinking, which is based on systems of concepts or technical categories contained in explanations, proofs and planning;

- practical thinking, simple, routine, manipulative thinking, which can be associated with the assembly and disassembly of technical equipment, with discovery and diagnosis, with the inspection of new products.

For the development of technical thinking, a natural and important tool can be found in solving technical problems - K. Kraszewski [25] which is both a means and an end of teaching, regardless of whether these issues are of a cognitive or application nature. C. Gilbert [26] has shown a similarity between the problem-solving procedure and the process of producing or using technical equipment (i.e. technological process).

4. Technical kits as illustrative training aids in vocational training

The issue of kits has been debated and published in many professional journals, as well as at international conferences and seminars. An elementary general, comprehensive perspective of technical kits from a terminological and didactic point of view, including their application to teaching, is offered by J. Dostál [27] and later C. Serafin [28].

Before further analysis, it is useful to carry out some conceptual analysis, which in the case of technical building blocks can be done from two perspectives [28]:

1. Pedagogical-psychological, which defines technical building blocks as teaching aids used for learning in the form of:

   - application of didactic principles (such as demonstration, scientificity; connection between theory and practice; individual approach; appropriateness or permanence);

   - the integration of technical kits into the system of teaching aids;

   - a psychological and special pedagogical view of the kits as part of the pupil's development, both shaping and helping it;

2. professional-technical - this is the design aspect (e.g. safety, durability, reliability, ease of maintenance, operation, etc.), but this aspect must also always be linked to the pedagogical aspect in the context of teaching.

What is a technical kit? The definition of this term (yes it is a term) must be approached from two perspectives - technical and pedagogical.

The dictionary definition [29] states that kits are "unified functional parts (blocks) that are physically and logically compatible with each other and facilitate the construction of assemblies with various industrial and laboratory uses". They are therefore "collections of objects that are to be assembled or joined to form a particular unit and also disassembled". This concept is a technical definition.

C. Serafin [28] states that construction kits are mainly teaching aids which, in order to facilitate the assembly of objects (devices), are defined by their parts, their construction using a presented pattern and/or personal imagination. According to C. Serafin [28], the purpose of using technical building blocks in teaching can be:

- increase the effectiveness of education;

- give pupils a sense of technical engineering;

- explain the basic rules, terms, and principles;

- think through problems and solve them;

- pique the imagination and creativity of pupils;

- introduce elements of playfulness into education.

    ... we could go on.

The main goal of using technical kits in education can be considered to be the introduction of pupils to the basic knowledge of technical engineering and electronics, the deepening and expansion of their awareness, as well as the creation and improvement of their work skills and habits. The tasks solved with the use of kits on the basis of acquiring a certain degree of theoretical knowledge help with the development of logical and creative thinking. Furthermore, a successful assembly and performance of operations related to correctly closing and operating a circuit, device, or apparatus give the pupils a sense of self-realisation. The use of technical kits offers a suitable way to develop the technological knowledge of pupils, to deepen the illustrative nature of teaching, and at the same time to have pupils learn simple experimental work. Pupils find themselves in an active contact with studied phenomena, directly receive stimuli through their sensory organs, and thus specifically learn about the characteristics of the studied phenomena. When engaged in laboratory work, the pupils cause electrical phenomena and processes to occur, solving tasks and explaining the nature of the studied phenomena which they find hard to explain in terms of theory (this is especially true for electrical engineering). Finally, they arrive at conclusions, natural-scientific and technological theorems, and verify what was deductively communicated to them. This makes classes more interesting to pupils, and the acquired knowledge illustrative.

In connection with technical kits in the teaching environment, we can establish the most important positive and negative aspects (see below).

The positive aspects include [28]:

- pupils are not overworked as they can set their own pace;

- proportionality in regard to developmental aspects (puberty, motor skills, perception);

- a suitable microclimate is provided;

- the voltage is very small (approximately up to 12 V), meaning that the value of flowing currents can be measured in milliamperes – it is always necessary to eliminate any possibility of electrical injury;

- the used materials are harmless; the colours cannot be wiped off;

- ergonomic perspectives are adhered to.

Negative aspects include [28]:

- static sedentary work (though not always);

- pupils' eyesight is stressed (depending on the size of function units);

- strenuous assembly (depending on the nature/type of kit).

In this context, it is worth mentioning again the constructivist approach to education, where the constructivist theory emphasises the active participation of the subjects, i.e. that they do not acquire their knowledge passively, but construct it themselves. Learners' knowledge and skills are developed in an organised environment and are adapted to this environment in a complex way.

The constructivist approach in teaching is based primarily on the pupils' activities and is intended to lead to the development of their cognitive abilities, their thinking and creativity (both mental and manual). However, an important role is played by motivation, activation, autonomy and respect; respect for pupils who interpret new facts on the basis of their own understanding of what they have learned now and previously, their existing knowledge and experience. These mental structures thus form patterns as the basis for new, constructed knowledge.

If a teacher adopts a constructivist approach in his/her teaching, then he/she assesses and diagnoses the students' dispositions and attitudes towards the expected content and the way of processing it, and then adapts his/her practice to these results (for more details see L. Hajerová-Műllerová et al. [30]). It is therefore primarily up to the teacher (although the pupils play the main role here) to create the appropriate conditions and provide the materials to facilitate pupils' construction of knowledge, while respecting their individual peculiarities and pace. The teacher must ensure that pupils are active, motivate them, guide them and link their knowledge to activities and skills. Whether we want it or not, this construct is ideally combined with the use of constructive, technical building blocks.

5. Technical kits and modelling

The current concept of models and modelling is multifaceted and reflects the multiformity of human actions. Generally speaking, models can be divided into two groups [28]:

- *Models of reality* - these are models that are identical to the original in terms of their physical nature, they can also be mathematical models whose purpose is to discover/clarify laws that will be experimentally verified. In this concept, models

are isomorphic, as there is an analogy between the elements of the model and the objects being modelled, while the interrelationships are preserved. Three aspects apply to models - reflexivity, symmetry and transitivity.

- *Theoretical models* - these are always mathematical models that are based on either a model of reality or a model of theory. However, within this concept, not all parts of reality are modelled, the representation of elements is not mutually unambiguous, the relationships between the elements represented are not preserved or symmetry is missing. Such models are homomorphic.

Model can be understood as a mentally conceivable or materially realisable (technical) system that reflects or represents the object of investigation and that is capable of replacing it so that by examining it new information about the object being modelled can be obtained [31]. For example, the relevant configuration of wiring units, assembled by a student on an electronic kit, is an example of such a model, and thus represents to some extent the result of a back-transformation of the model (i.e., the electrical schematic) to the original original (i.e., the electrical device). In order to clearly differentiate technical kits from actual originals used in technical practice, it is more appropriate to call them "pseudo-originals".

In technical practice, one often encounters a "reverse transformation" (due to specific conditions), meaning the creation of a technical original, i.e. a new product, or an improvement of the technical condition (such condition is often addressed, for example, by amateur electronics). **Figure 1** shows a diagram for modelling technical practice by the application of technical kits.

Explanatory function is one of the most important roles any model can have. In relation to experiments, the term *modelling* can be understood to mean the relationship between two independent objects – a primary problem object, and a secondary model. Modelling makes it possible to solve a problem with a single object (be it a physical, or mathematical one), and then mentally infer the solution, using the second object. Therefore, the similarity between both objects or their behaviour always serves as the basis. Modelling can be divided into [31]:

- *physical modelling* – an object's physical model can capture not only its mathematic specifications, but important physical behaviour. We distinguish between:

  a. *similarity modelling* – the problems being solved are physically similar to one another which means that they share a non-dimensional description and that non-dimensional arguments correspond to one another, i.e. similarity criteria;

  b. *analogue modelling* – basically two identical problems, with the same mathematical description. Two objects which are physically completely different from one another (e.g. the flow of liquid in pipes vs. electric current in a conductor) can have the same mathematical description;
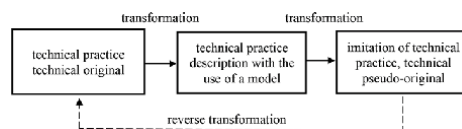
Figure 1.
Diagram for modelling technical practice by the application of technical kits.

- *Computational modelling* – a theory must be formulated for this type of modelling, but no physical model is necessary.

The modelling of technical reality and the process of creating technical models represent a fundamental area that accompanies the creation and application of technical kits in education [28]. As already mentioned here, working with technical building blocks develops technical imagination in students as an important intellectual activity, so very important and integral part of technical thinking. Technical thinking and technical imagination are two sides of the same coin, whose content is directed into the realm of technology and which, like the coin, cannot be separated. Technical imagination influences the development of technical thinking and technical thinking conditions technical imagination.

The purpose of working with technical building blocks in the context of both modelling and constructivism is for the pupil to be able to draw an analogy between the original and the model (a kind of pseudo-original) on the basis of the model. A necessary condition is the correspondence in the structure of both systems and their properties (the construction of any technical kit is then defined and limited by this condition). Thus, the technical object under study, whose model is created by means of a technical kit, is actually any device (black box) using this pseudo-original.

Modelling, the creation of models, is of course a creative activity and as such is part of technical experimentation and research, part of the cognitive process. In teaching, then, we call this activity an educational technical experiment as the realisation of a heuristic method of discovering new knowledge through a sophisticated procedure of observation, investigation, measurement and evaluation by exact means, i.e., measurement. The aim is to reveal new information about a phenomenon, material, etc.

Working with different kits is one of the chief points of general vocational training. The reason why we say this is that it is important to actively involve pupils in the subject of study. In case of technical kits, this is most often implemented by experiments – technical experiments, be it in regular classes held in a classroom, or at a laboratory. Technical experiments is to give pupils a sense of technical reality or processes. Experimental activities are a prominent part of the cognitive process and also a method for evoking direct experiences which result in the acquisition of knowledge.

Academic technical experiments are characterised by a systematic psychological activity for the purpose of acquiring knowledge which brings about deeper, but at the same time general technical thinking.

In the school environment, technical experiments include the development of pupils' independent creative activities and their logical thinking; the formation of scientific-technical notions about the studied object; the development of positive and realistic attitudes to technics; discovering physical laws; forming a correct relationship to technical-economic tools; and developing the pupils' ability to express themselves.

Academic technical experiments can be classified in many different ways, for example [2]:

- according to their relationship to technical practice (technical or technological experiments);

- according to their external form (academic, in hobby clubs, or home experiments);

- according to their internal form (student's – performed by the students; demonstrative – performed by the teacher);

- according to the identity of the experimenter (educator, or the educated);

- according to the function of the cognitive process (verification, illustration, application, problem);

- according to the stage of the education process (motivation, acquisition, testing).

Technical experiments supported by the use of technical kits encourage pupils to master the methods and experimental skills related to electrical engineering, as well as practical skills and general work habits. When using a technical kit in a school technical experiment, it is necessary for students to see the experiment as a necessary and natural consequence of their learning activities, to need to observe phenomena and to test theories.

6. Technical kits as material didactic training tools

On a general level, kits can be characterised as a set of objects whose purpose is to be assembled and combined into arbitrary or strictly defined wholes, forming objects which can then be disassembled.

Technical kits perfectly fit into this definition, but how do they work in the context of teaching? What is the situation with their inclusion in didactic training tools [2], i.e. material didactic training tools? Generally speaking, such material didactic training tools can be divided into training aids and didactic technical equipment. Technical kits can be categorised not only as training aids, but also as a system of didactic technical equipment, especially if they are combined with a control computer.

Attitudes towards the use of the term "training aid" J. Drahovzal et al. [32] and P. Bohony [33] have been varied and not always clear. Considering the aim of this study, let us endorse the definition formulated by A. Hašková [34] or J. Pavelka [35]: "A training aid is such a material didactic training tool whose didactic functions facilitate a more effective attainment of the teaching's goals and which serves as a prerequisite for meeting guidance/education goals."

From the perspective of fundamental pedagogical categories, training aids rank behind *goal – content – methods* [32]. This does not mean, however, that their role is marginal. Over the course of schooling, the educator temporarily objectifies one of his or her functions by using training aids, in fact. Objectification can be understood as an intentional transfer of a function, characterised by a typical subjectivism, to a technical system which guarantees its objective and standard nature [32].

According to A. Melezinek [36] *training aids* (especially those of a technical nature) can be divided into *non-adaptive* ones which are related to a one-way communication, i.e. the educator to the educated, and *adaptive ones*, involved in a two-way communication that includes feedback. This division is not strictly defined (**Figure 2**).

In this respect, A. Melazinek [36] mentions the term *technology of teaching* which describes the aggregate of all technical devices and systems used during schooling, one of them being electrotechnical kits. This issue is further elaborated by A. Hašková [1].
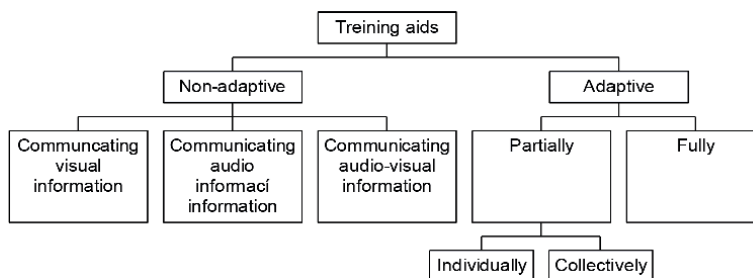
Figure 2.
Training aids classification.

In the guidance-education process, training aids can be rationally used as [32]:

- motivation and simulation tools, i.e. means of stoking a pupil's internal relationship to learning, of solving problems and problem situations which encourage creative searching, discovering, and acting;

- sources of information which give the pupil a sense of the curriculum in a way that makes the process of learning as easy as possible; as a means of verbal and non-verbal communication, training aids should help the pupil understand the nature of various phenomena in different ways;

- tools for systemising knowledge in order to connect new knowledge with previously learned terms and information; training aids should make it easier for pupils to organise the lesson's subject matter;

- tools for mastering work methods while learning about new phenomena;

- tools for combining school and practice;

- tools for assuming a differentiated approach to the pupil.

Clearly, training aids are a prominent link in the process of creating knowledge and verifying its validity, but their content, form, and presentation in education also affect the overall formation of the pupil's personality and encourage them to fulfil their current and perspective tasks and goals.

When dealing with the issue of updating the teaching management process, especially from the perspective of *humanising the education system*, it is necessary to ask: "In the teaching process, what kind of training aids (i.e. technical kits, too) should make up the indispensable foundation of the school's methodical equipment?" To answer this question, we will further delve into the classification and categorisation of training aids whose content differentiation and concretisation can be based on the following perspectives:

- incorporating electrotechnical kits into education drastically changes the way an educator works. The share of "living labour", which has been a prevailing factor in their work up until now, decreases. In terms of the replaceability and irreplaceability of the so-called living labour, traditional education can be compared to the "manufactory" period of technical development when viewed from the

perspective of modern production. Such replaceability manifests itself wherever an activity does not require one to directly participate in managing the process of guidance/education;

- in the interest of improving teaching's effectiveness as a whole, it is useful to relieve the educator of all activities of a non-creative nature (e.g. the evaluation of didactic tests, homework, practice, etc.). Such activities can be automated, or mechanised and ceded to didactic technical equipment (on the basis of a continuous feedback registered by a programme or a feedback device).

There is a manifest trend in the process of managing education to implement a so-called automated teaching system which, in regard to teaching with electrotechnical kits, consists of [28]:

- an education management programme, i.e. the expected algorithm for educating pupils, structuring the expected learning and teaching methods, and the educator's optimum approach to meeting guidance/education goals;

- material didactic training tools (training aids, kits, didactic technical equipment, micro- and macro-environmental architectonic solutions);

- diagnostic technical equipment to assess results and regulate guidance/education processes;

- pupils' learning activities themselves and their management by the educator in the scope of programme management.

An education management programme can be viewed as a general principle, i.e. a methodical algorithm for the sequence of the educator's and pupil's didactic activities which facilitates the objectification of learning's basic functions and the effective management of the guidance-education process L. Zormanová [37] which includes, among other things, operating technical kits. An education algorithm, differentiated with respect to the basic groups of pupils who take part in the education process, is a fundamental element.

Material tools act as a catalyst in the educator's hands and change into tools of modern communication, of managing and regulating learning activities. They can effectively contribute to the development of the creative activities educators and pupils engage in, as long as they are used in a methodically correct fashion.

The contemporary development of training aids is heading towards a gradual formation of a complex communication system in practical education. Through this system, the connection between humans and technics will be established more quickly and most of all more easily.

Every training aid (i.e. electrotechnical kits as well) can work not only as a carrier of information, but also as its communicator. It can evoke the dynamism of the cognitive process in relation to didactic activities. At the same time, it can influence the emotional and volitional sphere of the pupil's personality development to a different extent. The so-called "pedagogised aids", i.e. objects adjusted to didactic purposes (e.g. a methodical use of an electric motor section) are also more illustrative.

In the education process, electrotechnical kits are used as a tool to meet education goals, thus facilitating interactions between the educator, pupil, and electrotechnical
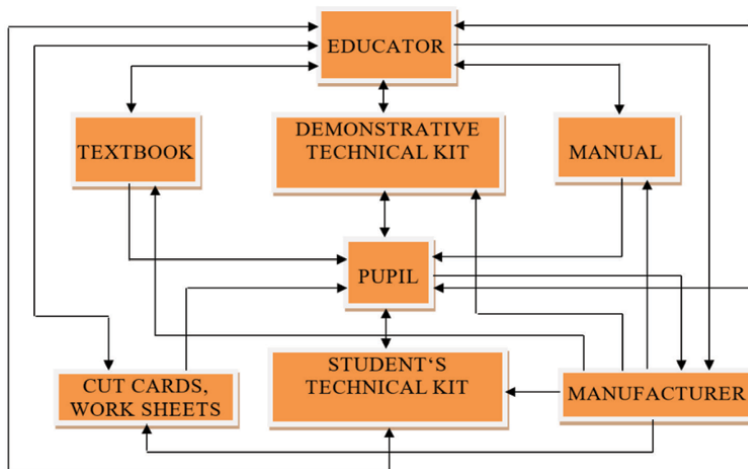
Figure 3.
The communication structure of frontal education with the use of technical kits.

kit. Such interactions take place in different ways – verbally, non-verbally, by means of activities, etc. **Figure 3** shows the communication structure of the entire system where communication flows between the system's individual elements.

Obviously, education can become effective when the educative potential of technical kits is applied and harnessed, but technical kits themselves do not guarantee effective education.

These two perspectives also need to be employed when choosing technical kits. In this case, the technical viewpoint must be made subordinate to the need in order to emphasise the important aspects of a demonstrated phenomenon, for the experiment to be illustrative and clearly arranged, and to provoke pupils' thinking.

Training aids, and thus technical kits as well, are characterised by a close relationship to the content of teaching. In the education process, aids directly affect the pupils' learning activities by their didactic functions and become a part in the transmission channel between the educator and pupils.

7. Pupils as users of technical kits

Pupils and the educator participate in the education process, constitute an active force in educational activities, and at the same time are their own guidance operators. The quality of the educational influence's results also strongly depends on the internal prerequisites of the educator's and pupils' personalities, as well as on the quality and intensity of their mutual interaction.

A pupil's personality goes through different stages of development, changes. In each age span, it gains certain characteristics which are typical for the given period and age group. These age-related particularities need to be respected in the education process, too [38] – this naturally fully applies to the relationship with technical kits.

The personality of the person being educated cannot be perceived in isolation as a passive object of our influence. Each individual perceives and receives stimuli from the external environment in a unique, different fashion, and also reacts to them in diverse ways. He or she affects the external environmental factors in return,

influencing, shaping, and remoulding them. This active influence, however, is directed not only towards stimuli from the external environment, but towards oneself. Over time, a pupil becomes a self-regulating agent who sets autonomous goals, imposes tasks on themselves, and decides how to achieve them. The ability of autoregulation and self-education should be one of the chief aims of the education process.

Different children perceive school education differently: there are big disparities, both from the perspective of psychological and physical development. In the guidance-education process, the individual being educated is not isolated but has diverse relationships with the other elements in their environment. At the same time, though, it must be stressed that playing is an activity in which children engage from a very early age and which satisfies their inner needs. All objects they play with, i.e. objects whose shape, composition, and purpose are adapted to the purpose of children's games, help them express their ideas, dreams, and wishes and develop their skills or abilities. The educational significance of toys lies in the expansion and enrichment of a fundamental children's activity – playing – in coexistence with the universal development of their personality.

Activities with a prevalence of physical exercise constitute a significant part of a pupil's day. In pre-school age, they result in the development of basic manual skills. According to E. Takáčová [39], children and playing are two terms which have been associated with one another from time immemorial. As the child's ability to navigate the outside world increases, so does the manner of their playing. Toys open the door to the world of children's games. Children's toys can be evaluated from three basic perspectives which apply to electrotechnical kits as well:

- pedagogical perspective – games inspire a child to engage in a creative activity;

- hygienic-safety perspective – cleanliness, harmless materials, and safety;

- aesthetic perspective – a toy, in fact, is the very first artistic object a child encounters.

Nowadays, toys and games of diverse types are a part of daily life, positively shape one's personality, and are a means of developing one's technical and artistic expression.

Insight gained from brain research shows that the left hemisphere, characterised as verbal and rational, is dominant for speech, while the right one is emotive, non-verbal, intuitive and controls, among other things, emotions, holistic processes, one's global worldview, spatial perception and orientation. In childhood, a pupil's right hemisphere is more mature than the left one, which is why functions controlled by the right hemisphere prevail in the child's psychology. According to J. Brierley [40], there are apparent differences between the activities girls and boys engage in. On average, all left-hemisphere-mediated speech functions are slightly more advanced in girls than in boys of the same age. In case of boys, non-verbal spatial functions, mediated by the right hemisphere, and ability to conduct spatial work with patterns and shapes are more developed. Actually, boys as young as two perform better in this area. It follows, then, that boys excel in examining things, which is a crucial factor in natural or technical sciences, a fact that is significantly affected by the selection of and preference for the materials and equipment used in schools. This is exactly where kits come into play. By incorporating them, we introduce an element of playing into

the guidance-education process (E. Roučová [41] mentions the term "technical toy" which denotes a certain technical object or several of its technical elements).

Playing with kits can have an immense educational effect on children. To undergo cognitive development, a child needs to have toys that develop psychological functions: perception, memory, imagination, thinking. Kits fulfil this precise requirement. When a pupil observes, perceives, and acquires new information or knowledge, they are encouraged to construct and model, study the principles, etc. All of these activities force them to think, draw on their existing knowledge, rely on their imagination, and most of all create new things while learning how to evaluate.

The process of acquiring skills and habits has three stages [38]:

1. the acquisition of knowledge;

2. the acquisition of motor and sensory skills;

3. the acquisition of habits.

Skills and habits are formed and perfected when complex conditioned responses emerge and become reinforced. That is why there are three stages of motor and sensory skills which lead to the acquisition of habits [38]:

a. generalisation stage – irradiation of excitations in the motor region of cerebral cortex. Movements are made uneconomically;

b. concentration stage – corresponds to a gradual concentration of excitations in the brain's motor centre; temporary conditioned responses are formed;

c. automation stage – corresponds to the reinforcement of stereotypes.

Applying these phases and stages to the guidance-education process (generally) results not only in the acquisition of knowledge and skills, but also in a heightened awareness of work organisation, hygiene, and occupational safety, as well as in the formation of a worldview and future occupational orientation. In particular, children can use technical kits to learn effectively which allows such kits to be included under the work term "*didactic toys*".

Technical kits develop not only technical skills, but also social relationships. According to J. Daněk and M. Šmejkalová [42], construction almost always forces pupils to cooperate, communicate with one another, and exchange elements they need in order to complete a project. Pupils share their experience when working together. Working with any kit in schools is challenging not only in terms of organisation, but also of thinking and technical imagination. That is why kits are viewed as a toy which greatly affects the development of children's thinking and is notable due to its high formative value. Playing with kits also frequently works as a tool of socialisation.

8. Technical kits and the technical creativity of pupils

In relation to the issues described above, it is useful to talk about creativity, in this context namely about technical creativity. Defining "creativity" has been a point

of interest for many scientists. They are not united in their views – there are many definitions which try to describe this term [12, 43, 44]. For our text, the following will suffice: "*creativity is a human ability based on cognitive and motivation processes where inspiration, imagination, and intuition are also involved to a great extent. It manifests itself in coming up with such solutions that are correct, and at the same time new, unusual, and unexpected*" [45].

In technical vocational education, creativity is conceptualised as part of the general creativity that is taught, although there are of course some specific disciplines where the creative process is indirectly or peripherally involved in teaching (example: electrical engineering versus economics).

The concept of creativity can be narrowed down to technical creativity, i.e. creative technical activity, then we mean basic technical skills, technical communication skills (verbal and graphic), the ability to use working tools or devices and then apply them in technical and non-technical practice. Closely related to the above is the notion of technical fitness, which is the ability to perform work movements as a result of coordination between the relevant muscle groups and between muscle action and thinking.

If pupils are encouraged to be creative, then creativity is an organic part of education that enhances working skills, influences social relationships and facilitates the overall development of the pupil's personality. According to J. Hlavsa [46], the goal of guiding pupils to creativity should be precisely the formation of their creative personality with regard to effective work activities, self-formation and optimization of social behaviour. Identification of the interconnection of creative activities with vocational education creates conditions for the development of creative technical thinking in pupils. Y. K. Michael [47] states that the basic characteristics of creative technical thinking are originality and independence.

Keeping to J. Hlavsa [46], we can state that the creative thinking of pupils is a mental process characterised by self-reliance and the ability to recognise and solve unknown matters based on what has already been recognised.

As has been said here several times, the creative process accompanies all activities of a creative nature, especially those of a technical nature. Working with technical building blocks can serve as a model example of the development of the creative process in terms of creative skills and the application of creative technical thinking. According to A. Marszałek [48], the creative process can be divided into four basic stages with regard to technical subjects:

- *initiation stage* - includes the pupil's previous life, his education, skill, emotions, etc.;

- *incubation stage* - the stage of searching for a solution. This phase requires from the pupils a higher level of questioning ability as well as a more intensive involvement (searching for sources, looking for connections and analogies or alternatives);

- *illumination phase* - this is the phase of discovering a partial or even definitive solution. This phase cannot be planned, it is possible to observe the circumstances that contribute to the solution;

- *verification phase* - this is the testing of the solution in practice.

Methods of developing technical creativity and creative technical thinking are discussed, for example, by I. Lokšová [49] and H. Lytton [50]). If we decide to study ways of developing creativity, we have to start from heuristic methods. Based on the classical categorisation of J. Čáp [51], this is the following division:

- question formulation - whether we are successful in trying to solve a problem creatively depends on how well the questions are formulated;

- generating a significant number of hypotheses, ideas and suggestions - most of us tend to be brief. In practice, however, it is better to list a large number of ideas and then proceed to the selection process later;

- motivation to produce ideas - there is a need to take the fear and anxiety out of asking questions and instead engage students in discussion and creative activity. Once the pupils lose their shyness, they usually start to improve their proposals themselves;

- separating idea generation from idea evaluation - we usually tend to evaluate an idea as soon as it is discovered. We need to wait a while and put them aside as a better idea may emerge;

- organising information, using it and gathering it in the context of new data - this is about representing data and interpreting it, as well as finding more new information;

- reframing the problem - a complex problem should be broken down into sub-problems. Synthesising these sub-problems can then lead to a solution to the original complex problem;

- overcoming the habitual or usual view of phenomena - it is actually the inability to perceive things differently, through a different lens;

- wild ideas - even extreme, often provocative ideas are sometimes great ideas and may be necessary to solve problems, especially if one has to come up with a completely new solution;

- combining different elements - combining familiar elements from a whole in an unusual way;

- analogy - a common approach to problem solving. This approach is based on one's own past experience in solving a similar problem;

- talking out loud - helping to clarify a difficult problem by retelling it;

- group solution - uses different perspectives from different people who are familiar with the content of the problem;

- external activities and modelling is a method of simplifying a complex problem into a model by considering a limited number of external conditions;

- unusual association - a solution to a problem may emerge from unusual facts and similar associations. It is recommended to postpone solving the problem, focus on something else, and then return to solving the problem.

The above classification is therefore closely related to the promotion of creativity also in relation to technical building blocks. A. Petrova [43], J. Honzíková [52] state that the most important methods of creativity development include brainstorming, HOBO technique, Phillips 66 technique and 635 technique, among others.

Methods for developing creativity place exceptionally big demands on the educator who must divide pupils into groups, formulate tasks, monitor their solving as well as the pupils' reactions, and regularly make qualified interventions. It is also appropriate for the teacher to evaluate whether submitted solutions are correct.

9. Technical kits in Czech primary school

The main objective of the research was to identify, analyse and then describe the current state of teaching using technical kits in primary schools in the Czech Republic. Teachers in primary schools and multi-year grammar schools in the Olomouc, Zlin and Moravian-Silesian regions were contacted. A self-constructed questionnaire was used as a research tool for data collection, which was distributed to the respondents, filled in and electronically evaluated using MS Excel statistical tools. From the available tools for the questionnaire, the cloud application Google Forms was selected, whose services suited the nature and structure of the questions.

The questionnaire was distributed via email, which, in addition to the accompanying message text, also contained a link through which respondents could access the questionnaire. Most of the questions in the questionnaire were set as mandatory, meaning that the respondent had to comment. However, the questionnaire also contained questions marked as optional, for which the respondent indicated a response only if he or she was able or willing to answer on the issue.

The questionnaire consisted of three parts. The first part contained questions aimed at quantifying the respondents. The second part dealt with teaching experience and the third assessed the reasons and also offered suggestions from the respondents. We asked about active experiences with building blocks in teaching (e.g. in what way, what methodological materials, what types of building blocks, in what subjects, etc.), as well as the context of computer science, programming opportunities, digital literacy development, and reasons for not using building blocks in teaching. In total, the questionnaire contained 30 questions.

The primary use of engineering kits by respondents varies from subject to subject. **Figure 4** shows the top 4 most frequently reported subjects (including leisure activities) with kit-supported learning and the ways in which respondents use kits in these subjects. As can be seen from **Figure 4**, for most of them the main area of interest is problem solving and in the case of the Computer Science subject then programming and algorithmization. Then, in Technical Education, the most common areas of interest are learning about how technology works and competitions. Not surprisingly, in the teaching of physics, the implementation of measurements using sensors (**Table 1**).

Nowadays, there is a considerable number of technical kits on the market that can be applied to teaching. According to the answers of our respondents, it is evident that the leading position is held by construction-oriented building sets such as LEGO,
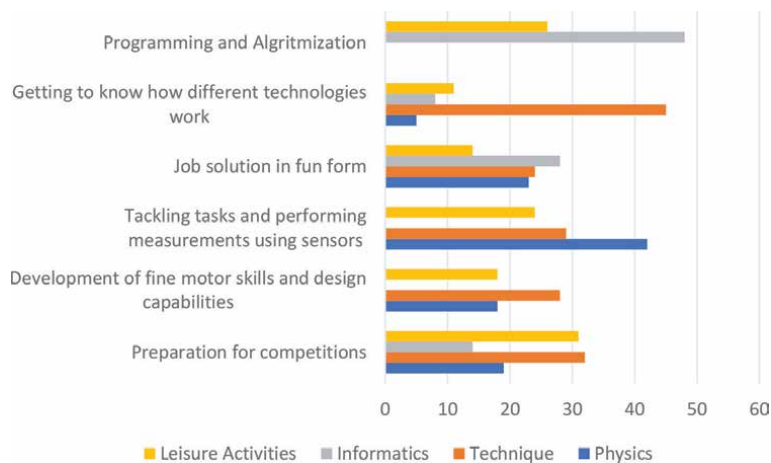
Figure 4.
Active experience with technical kits in teaching.

Gender	Age	Number
woman	under 26 years	8
	27 to 40 years	14
	40 to 50 years	16
	over 50 years	20
	Σ	58
man	under 26 years	5
	27 to 40 years	10
	40 to 50 years	12
	over 50 years	14
	Σ	41
Total respondents		99

Table 1.
Gender and age distribution of respondents.

which is known mainly for its technical building sets that connect the construction area with robotics, programming. Many respondents also reported a combination of several building blocks, but where LEGO building blocks were always the most represented. The Czech kit Merkur, which also has its robotic variants, ranks next in terms of number of users.

An essential part of teaching with kits, which each teacher may have a slightly different perspective on, is construction, even in terms of the type of technical kit. Due to the lack of definition of this area in the curriculum of primary schools in the Czech Republic and the prevailing low hourly allocation, the teacher has to decide what he/she wants to primarily focus on in teaching. If the primary goal of the lesson is not construction, the process of model building may be shortened (which is, of course, undesirable). Thus, the contribution of constructing to the overall lesson process and the teachers' own perspectives on constructing were investigated. Teachers who

Percentage of constructing on the implemented activity	Frequency of respondents
10%	11
20%	8
30%	12
40%	24
50%	26
More than 50%	47
Pupils only implement the activities, the model gets built	13

Table 2.
Proportion of construction in the implementation of short tasks in one lesson.

tend to use a set of shorter tasks within the lesson have a different contribution of construction to the flow of the lesson. About half, however, report that constructing a model takes pupils at least half of the lesson. In an ideal situation, this leaves roughly 20 minutes in a lesson (45 minutes) for the actual functionality, measurements and other activities (**Table 2**).

A very important factor that can discourage teachers from using kits is insufficient or inadequate methodological support. Thanks to the Internet, there is a large number of teaching materials, themes and examples available. However, not all of them are suitable for teaching. Therefore, we tried to find out from our respondents what type of methodological materials they use and to what extent in their teaching. As we found, respondents most often rely on the manual that is part of the kit supplied by the manufacturer (69% of respondents). This is understandable because these manuals or instructions usually contain all the basic information for working with the kit and also provide some tasks that can be done with the kit. Another source of information is then the internet (21% of respondents), both from websites (kit manufacturers or user communities (11% of respondents) and instructional videos (9% of respondents). Respondents either adopt the information obtained in this way into their own teaching or modify it and create their own tasks based on it. To a lesser extent, respondents reported working with a variety of texts, including foreign literature.

10. Conclusion

The education strategy in the Czech Republic is based on the development of polytechnic education, informatics and the promotion of digital literacy. However, strategies are one thing, but real support is another. Despite some positive steps associated with European Union projects, support for technical and natural science areas in particular is relatively weak, and this concerns not only material and technological support for teaching, but also, and above all, methodological and knowledge and skills support on the part of teachers.

Technology has an irreplaceable place in education at all levels. It takes on a special positive significance in combination with the desired development of digital and information literacy, where technology in the form of building blocks offers tools and procedures that contribute to this development in a positive way for both pupils and teachers. However, the building blocks in the concept of teaching aids must respect the functional and temporal specificities of teaching, both gnoseologically

and logically. It is understandable that a content analysis of the teaching process will best show the teacher the optimal possibilities for selecting appropriate methods and forms of teaching, including adequate teaching aids, but also teaching programmes and didactic techniques, but the teacher must apply all this creatively.

The area of the use and integration of technical building blocks into the teaching process is conditioned by many factors, which have been even partially mentioned here, but it should be borne in mind that the current development is directed towards the creation of complex technological systems combining both the constructional and the informatics and digital areas. Through such tools, a faster and, above all, easier transfer of information between teacher and pupil is realised. Thus, the application of technical building blocks can provide pupils with practical skills, knowledge and habits in addition to the development of their intellectual abilities and skills in the broadest spectrum, and the building blocks can be considered as a comprehensive tool for pupil development. By using knowledge from the field of creativity, especially technical creativity, as well as didactics, subject and subject area, this goal can be achieved and pupils can develop skills such as problem formulation, general approach to problem solving, ability to find a solution and optimise it in every situation. This applies to everyone's everyday life.

In conclusion, technical building blocks are undoubtedly an interesting technical system for educational activities. Therefore, they deserve to be significantly included in the material and technical base of all types and levels of schools, where pupils prepare theoretically and practically for their personal and professional life.

Author details

Cestmir Serafin
Faculty of Education, Palacký University in Olomouc, Olomouc, Czech Republic

*Address all correspondence to: cestmir.serafin@upol.cz

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Chapter 15

Using Language as a Social Semiotic Tool in Virtual Science Instruction

Magdalena Pando

Abstract

This chapter offers a pedagogical approach for teachers in virtual science teaching that creates virtual hands-on practice for culturally and linguistically diverse (CLD) students to 'do science' and 'talk science'. This chapter features the use of technology applications where elementary- and middle-school teachers create opportunities for students to interact with online simulations, make observations in science experiments, generate claims, gather evidence and reason about concepts to construct oral/written scientific explanations. Scientific explanations are a common discourse practice that scientific communities engage in by interacting with science phenomena during inquiry investigations and present their contributions to science knowledge. The chapter focuses on the practice of constructing explanations utilizing one remote instructional lesson design that would engage teachers of CLD students in online instructional planning. The sociocultural theoretical constructs of mediation and zone of proximal development (ZPD) inform the instructional methods used to create opportunities for CLD students to make sense of science phenomena. Sociolinguistic theory informs the use of language as a social semiotic tool to communicate sense-making. Sociolinguistic theory also guides explicit focus on the structural features of science language that inform language scaffolding and meaningful activity planning intended to promote content-specific language output (e.g. science explanations) by CLD students.

Keywords: systemic functional linguistics, explanations, sociocultural theory, remote science teaching

1. Introduction

In early 2020 the Coronavirus worldwide pandemic set into motion a sudden mass movement from traditional face to face instruction to remote teaching. The sudden transformation in instructional delivery presented many challenges to education agencies, administrators, teachers, students, and families. Several challenges were encountered, including access to technology devices, access to internet service, and access to and proficiency in the use of virtual platforms for teaching and learning. This chapter presents one pedagogical approach informed by sociocultural and

sociolinguistic theoretical frameworks, where one teacher educator offers how to use language as a social semiotic tool in virtual science instruction to engage culturally and linguistically diverse students in science learning. This teacher educator integrates content, language, and technology as one way to actively engage CLD students in learning through science-specific disciplinary language for experiencing scientific phenomena to make sense of it through language. Teachers are invited to apply the pedagogical approach offered to engage students in remote science learning through the use of common scientific discourse practices, such as constructing science explanations. The theoretical framework informing the approach explains the constructs and significance of mediation, zone of proximal development (ZPD), interaction, and Systemic Functional Linguistics (SFL) to put into practice in lesson delivery for virtual implementation.

2. Theoretical framework

In this chapter, the author integrates sociocultural and sociolinguistic theoretical frameworks to propose a pedagogical approach in virtual science instruction. The integration of the two frameworks proposes a pedagogical approach on how to utilize language as a social semiotic tool for sense making in science remote instruction. Systemic Functional Linguistics (SFL) offers one genre for sense-making in science, the explanation genre. The theoretical framing is described next.

2.1 Sociocultural theory

In [1], sociocultural theory is concerned with how individual mental functioning is related to historical, cultural, and institutional context. "Hence, the focus of the sociocultural perspective is on the roles that participation in social interactions and culturally organized activities play in influencing psychological development" ([1], p. 1). According to sociocultural theory [1], learners participate in activities and internalize the effects of working together and in the process acquire knowledge and strategies of the world and culture. Wertsch and Lantolf [2, 3]. identified that the human mind is mediated through the use of culturally constructed tools and signs, which are also known as semiotics. Semiotics include physical tools and symbolic artifacts. According to [4], physical tools help humans mediate experience of their physical world through concrete tools (e.g., computers, objects, layout of built environments), whereas symbolic tools (e.g., language, literacy, concepts, numeracy) help mediate the individual's connection to the social world. Through the use of both types of tools, humans mediate their individual experience to their social and material world for sense-making. Thus, in science teaching it is important to identify the physical tools (diagrams, maps, models, etc.) and symbolic tools (language, literacy, concepts, etc.) to help students make sense of their learning as they interact with scientific phenomena in similar ways that scientific communities do.

Further, Vygotsky [5] defines the *Zone of Proximal Development* as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined by independent problem solving under adult guidance or in collaboration with more capable peers" ([5], p. 86). This collaboration from more experienced adults (as in the teacher) and more experienced peers (novice and expert peers) is critical for scaffolding learning tasks to get students from their actual learning potential to the next potential level. Because

sociocultural theory promotes development over time through the use of physical and symbolic tools, the ZPD is a central construct for developing understanding over time through the process of internalization, where learners rely less on external tools and gain the capacity to perform more complex tasks due their reliance on internal mediation [4]. This is why the provision of external tools in the form of scaffolding are meant to be provided for moving students from actual development levels (where there is more reliance on internal mediation) to potential developmental levels until internalized by the learner to move to the next potential development level. All of this happens through the recurrent external and internal use of scaffolded conceptual and linguistic tools and why it is important to afford students with multiple ways to experience and talk science.

Since the language of scientific communities requires specific uses of it in the discipline, it is also important to highlight constructs within sociolinguistic theory for utilizing language resources for sense-making.

2.2 Sociolinguistics theory

Hudson ([6], p. 4) defines sociolinguistics as "the study of language in relation to society, implying (intentionally) that sociolinguistics is part of the study of language." In this chapter it is important to note the intentional use of language as a symbolic tool for sense making and interacting in science. In doing so, the author will highlight common structural language forms or genres frequently used by the scientific community to make sense of their scientific worlds. The author accentuates the specific genre of science explanations as a social semiotic tool for sense making. First, social semiotics is concerned with meaning making and how language users make sense or meaning through language. SFL [7], proposes that language resources are shaped by how they are used by people to make meaning in the social function of language through three metafunctions: (1) ideational, (2) interpersonal, and (3) textual. The ideational metafunction is concerned with what is going on in the world to reflect experiential meaning about the world. The interpersonal metafunction relates to the use of language resources to interact with others. Lastly, the textual metafunction of language offers grammatical resources that work together to help language users create coherent and cohesive texts (written or oral). The textual metafunction links the ideational and interpersonal metafunctions to create a unified text [8].

Since this chapter offers a pedagogical approach for science teachers to use language as a social semiotic tool in science teaching, the author offers a few traditional common texts used for science sense making. One of the most frequently used texts are lab procedures, which traditionally include step by step instructions for carrying out a lab investigation. Another text may be a report, which would serve to communicate the findings of a lab investigation. These are more traditional in nature and more typical of taking place during face-to-face instruction and lab investigating activities. However, when scientists communicate inquiry investigations, they often do so using explanation and argumentative texts which serve the purpose to explain processes and cause-effect relationships intended to persuade their audience, which includes other members of the scientific community. Regardless of the text type at hand, one feature of frequently used science texts is that they include highly abstract and technical language. It is important for science learners to experience and interact with scientific phenomena to make sense of it before being expected to communicate through highly specialized science language. In this chapter the author offers one pedagogical approach using one specific science genre (text) to scaffold the content and language

tasks for CLD students. The approach offers teachers lesson design components to consider when planning the content and language tasks that will assist students to construct science explanations. Since the Coronavirus pandemic has transformed the way of instruction in face to face and remote instruction, I offer this approach as one to be planned for remote instruction, but that could also benefit those teachers using hybrid modes of instruction as many are returning to face to face instruction.

3. Pedagogical approach

The pedagogical approach offered here is one intended to integrate content and language learning for mediating science learning to 'do science' and 'talk science.' As mentioned previously, one text type (genre) will be highlighted in this chapter as a language resource to mediate experience in science learning through the use of physical tools (online simulations) and symbolic tools (language). First, this author proposes the structural layout of the social semiotic tool of explanation texts in science. They can be sequential in nature to explain how a process occurs or they can be causal in that they explain cause-effect relationships. Thus, one item to consider in lesson design (online or face to face) is the language tasks students will engage in when constructing science explanations to interact with their peers and teacher. In sequential explanations, Humphrey et al. [8] describe these as the phases of a process in sequence to reveal how a process occurs (e.g., the process explained in the water cycle through each phase), whereas causal explanations may explain sequence but also why the process occurs (e.g., heat's effect in each phase of the water cycle).

3.1 Instructional process

One instructional process commonly used in teaching is the 5E cycle. The 5E cycle includes the following instructional processes a teacher plans to provide experiential learning opportunities to students: (1) engage-teachers work to gain an understanding of students' prior knowledge; (2) explore-students actively explore new concepts through hands-on activities (or virtual hands-on learning experiences); (3) explain-helping students organize new knowledge and ask clarifying questions for what they learned during the explore phase; (4) elaborate-students apply what new knowledge they have learned; and (5) evaluate-teachers plan for assessment or observation to determine if the core concepts of the lesson have been clearly understood by students. This author wants to focus on the explore and explain phases of this learning model for instructional planning that provides students with opportunities to 'do science' and 'talk science'.

While language as a social semiotic tool is important for sense making and activities reflecting how students do this through the construction of science explanations, equally important is the experiential component of interacting with science phenomena. In face-to-face teaching this happens mostly during lab investigations, where students are afforded hands-on experience with lab equipment, substances, and manipulation of variables in lab investigations to observe and measure the effect of these. In remote teaching, the physical hands-on experience is not possible. However, virtual hands-on tools can be used in place of physical tools for students to engage in learning during the explore phase. One example of such a tool can be virtual simulations. The sudden mass movement required many education stakeholders to explore the availability of virtual resources for remote teaching. Some examples include

learning management systems (BlackBoard, Canvas, Moodle), while there are also synchronous teaching technology applications (Zoom, Microsoft Teams, nearpod, Padlet), in addition to game-based learning applications such as Kahoot and online simulations (PhET, Gizmo, CloudLabs STEM) to name a few.

3.2 Planning for student-centered learning

When planning for student-centered learning this pedagogical approach focuses on three aspects to learning so that students (including students from culturally and linguistically diverse backgrounds) are afforded multiple ways to interact with the content learned. One way is frequent experience opportunities with the content. Questions to consider are: (1) How will students interact with the content (visually, orally, videos, simulations)?; (2) What is the language of instruction and what language supports are afforded to CLD students who are not native speakers of a majority language? and (3) What are the intended conceptual and linguistic outcomes that are expected? A response to question three can be addressed by the specific formulation of content and language objectives to determine supports required to answer questions one and two. Technology is then utilized as a tool for exposing students to content and the use of virtual platforms for actively engaging students in the content to produce content and language outcomes. One of the greatest challenges as all educators moved to remote instruction in early 2020 was engaging students. One affordance in learning how to navigate this challenge is the growth in technology literacy and professional development for effective remote instruction that engages students. Thus, a central component when planning a lesson is to consider the specific content and language objectives that can be observed and measured during instruction and what technology platforms and applications will support students' interaction with the content and language to participate in disciplinary language use about the content via multiple modes of communication. Since explanations is the genre (text) of choice in this pedagogical approach. The author will describe the structural and grammatical features of science explanations for teacher planning.

3.3 Science explanations

As previously mentioned, one way to distinguish between the structural features of two common forms of explanations is by considering whether they describe a process or whether they describe a cause-effect relationship about science phenomena. Process or sequential explanations serve as intentional linguistic scaffolding for causal explanations. Thus, in science instructional design one might consider, what processes students will be learning in a lesson. One common type of process can be cycles, as in the water, or carbon dioxide cycle. Another type of process can be chemical processes (e.g., condensation, precipitation, evaporation, chemical changes, etc.) Let us take one content and learning objective as an example of the approach offered in this chapter.

> Content objective: students will identify chemical changes in a chemical reaction.
> Language objective: students will explain why the chemical changes occurred.

For the content objective, identification of chemical changes involves identifying chemical processes (e.g., rotting, burning, rusting, etc.). Taking the example of the

burning of sugar, one can observe that there are specific observations that can be made when burning sugar (color change, temperature change, phase change, etc.). A sequential explanation may include the observations made when heat was applied to sugar. One example of a sequential explanation may be the following:

Sequential explanation:

> *Heat was applied to a container that contained sugar (test tube).*
> *The sugar appeared white and in solid (granulated) form.*
> *The sugar started smoking.*
> *It is easy to observe that the smoking is indicating a change in temperature.*
> *The sugar started turning brown or burning.*
> *The white solid became a brown and thick liquid.*

The underlined portion of the above explanation is one way to measure the outcomes intended by the content objective (i.e., burning). The language objective now requires a causal explanation, which can be a sequential explanation plus a causal component. Notice that the sequential explanation offers a sequence of events of how the burning of sugar occurred. A causal component would require answering why the chemical process of burning occurred. In this case the increase in heat (cause) resulted in the formation of caramelized sugar (effect). One commonly used causal explanation framework utilized in science teaching and learning is the *Claims, Evidence, Reasoning* (CER) framework proposed in [9]. The CER framework supports instructional planning for teaching through the use of science explanations by scaffolding the explore and explain phases in the instructional process to provide students with opportunities to generate claims (which can be an answer to a question, or a conclusion drawn), opportunities to make or measure observations as evidence in support of their claim, and opportunities to justify why the evidence supports their claim through the application of scientific principles. In the above example, one applicable scientific principle can be that whenever there is a chemical change a chemical reaction results in the formation of a new substance with a different structure and different chemical/physical properties (i.e., started with granulated sugar or sucrose, the chemical change of burning resulted in the transformation of sucrose into caramel).

3.4 Interaction

Interaction being a critical component of both sociocultural theory and sociolinguistics for individuals to mediate human experience of the world requires providing opportunities where students can become active participants of science discourse. Since, explanations are one genre (text) commonly used in scientific communities, providing students opportunities to construct science explanations about science phenomena affords them ways to begin learning to use language in similar ways to scientific communities. The construction of science explanations in the example above is a prime example of how science texts, as in the use of the CER explanation framework, require a carefully constructed text that is coherently and cohesively organized to communicate meaning. This is symbolic of the textual metafunction of SFL. Equally important though is the interpersonal metafunction of SFL for using language as a social semiotic tool for sense-making. Science learners, as text composers, must consider who their intended audience is and what the subject matter is to

communicate meaning via science explanations. Under these circumstances, students communicate with other students and with the teacher about science-specific concepts and phenomena. Thus, teachers are encouraged to be very intentional in their planning of interaction opportunities to promote student-student interaction in addition to student-teacher interaction. It is important that the interaction opportunities be aligned to both the content and language objectives of the lesson. Interaction opportunities were one of the most experienced pedagogical challenges when the sudden movement to remote instruction was made. Platforms like Zoom permitted the use of breakout rooms, as one way to promote student-student interaction. However, it became quite difficult for the teacher to go from one breakout room to another, and while students were in breakout rooms, teachers were not able to view what interaction might have been occurring in other breakout rooms where the teacher was not present. Because of this, this author proposes the integration of technology platforms and applications that permit the technology resources to promote student-student, student-teacher, and teacher-student interaction in more concurrently visible ways. Some applications that capture the live interaction in whole virtual group (versus small break out groups) are described next.

Padlet is an interactive platform that gives the teacher access to all student communications. The comment posting feature captures language outcomes in written form. In doing so, students are able to post their science explanations. The platform permits the use of videos and links to online simulations for students to interact with content. Padlet also allows the ability to post voice memos. When working with students of CLD backgrounds, such as second language learners (SLL), posting comments onto a Padlet gives SLLs opportunities to develop their writing skills, whereas voice memos, affords them oral language opportunities and practice with listening comprehension. Further, this application provides students with opportunities to mediate science learning using language as a social semiotic tool to make sense of their learning experienced. Other applications such as nearpod have similar features, while online simulations offered by PhET offer great virtual hands-on experience for students to interact with the content via online simulations.

3.5 Scaffolding

Returning to the content and language objectives component for planning a virtual hands-on lesson, one must also consider the exploration phase of the 5E lesson cycle to intentionally decide what experiences to provide students with to scaffold their learning at the actual development level and assist them to advance to the next potential development level. This must happen at both the conceptual and linguistic levels. Recalling that the use of physical tools provides external mediation opportunities for students, language (specifically the language function of explaining) is one that can be internalized in some form of actual development for SLLs but should always be scaffolding the language tasks at potential developmental levels for second language learning. This approach promotes both content and language development through intentional planning.

In the use of sequential and causal explanations aforementioned, it is important that conceptually, students understand a process first before expected to understand causal conditions of manipulating a process for a specific outcome (effect) to occur. This level of scaffolded instruction targets both conceptual understanding and linguistic communication to experience science and communicate about science

phenomena experienced. Further, for CLD students who are learners of a second language, linguistic scaffolding also develops their language competence and proficiency over time, hence why language practice through interaction opportunities are so critical for this student.

4. Discussion

The integrated sociocultural and sociolinguistic theoretical framework informs a pedagogical approach where constructs like mediation, zone of proximal development, and interaction suggest using language as a social semiotic tool for science sense-making. Through the three metafunctions of language in SFL—ideational, interpersonal, textual—and the genre of science explanations, teachers use this integrated approach to intentionally plan for the targeted learning experiences in the *explore* phase to 'do science' and *explain* phase to 'talk science.' Since the coronavirus pandemic required a sudden mass movement from face-to-face instruction to remote instruction, it was also critical for this teacher educator to offer technology platforms and/or applications that would provide teachers of students with resources for planning the science *explore* phase. Thus, the approach offered here suggests the use of applications including but not limited to Padlet, nearpod, Kahoot, and PhET simulations to provide students with virtual hands-on practice to experience science learning. However, the same applications are also offered to teachers so that they are used for communication purposes using one genre commonly used by scientific communities—science explanations. Using this virtual pedagogical approach provides teachers with very intentional planning for conceptual and linguistic outcomes that together provides students with opportunities to mediate science learning, make sense of scientific phenomena, and engage in interaction through the use of science explanations. Use of the 5E instructional process, while always prioritizing the conceptual and linguistic outcomes of students, assists teachers in determining the scaffolding required in both content and language production to move students from actual to potential knowledge development levels as one way to be intentional about their zones of proximal development.

Implications for research suggest instructional interventions designed to measure second language learner conceptual and linguistic outcomes. Such interventions would inform intentional content and language teaching through measurement of fidelity of implementation. Interventions would measure student-intended content and language outcomes for CLD students. Additionally, instructional interventions would explore the effect of conceptual and linguistic scaffolding and their removal as students move from one knowledge development level to another. Lastly, interventions using this approach would help further inform the use of technology to enhance students' opportunities to explore science learning and communicate via discipline specific language use.

One limitation of this chapter is that the author centers only on one specific genre—explanations. Constructing arguments and the language skill of engaging argumentation not only requires the use of explanations, but also requires the use of persuasive language resources to persuade the scientific community and continue the construction of new scientific knowledge. In a classroom, students should also experience opportunities to engage in argumentation to experience different ways of knowing or epistemologies between them and their peers, but also ways to evaluate their own learning and refine their conceptual understanding of science phenomena.

5. Conclusion

This chapter concludes with the components of a pedagogical approach in virtual science teaching that aims to provide virtual hands-on content and language practice for culturally and linguistically diverse (CLD) students, such as SLLs, to 'do science' and 'talk science'. The author featured the use of technology applications in which teachers create opportunities for SLL students to interact with online simulations and use the CER explanations framework to construct oral/written scientific explanations. Constructing scientific explanations is a discourse practice in scientific communities used to communicate understanding and findings about inquiry investigations and make contributions to science knowledge construction. Sociocultural and sociolinguistic theories informed the pedagogical approach presented to better understand how language is used as social semiotic tool for sense-making. The sociocultural theoretical constructs of mediation and zone of proximal development informed the instructional process used in the explore and explain phases of the 5E learning cycle to create opportunities for CLD students to make sense of science phenomena. Sociolinguistic theory informs the use of language in the ideational, interpersonal, and textual functions through Systemic Functional Linguistics to propose how students can interact with content and explain science phenomena in coherent and cohesive ways.

Conflict of interest

The authors declare no conflict of interest.

Author details

Magdalena Pando
New Mexico State University, Las Cruces, New Mexico, United States of America

*Address all correspondence to: mpando@nmsu.edu

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Early Childhood Education Pedagogical Transformation in Tanzania: Innovations, Challenges and Prospects for Marginalised Children

Richard Shukia and Stansilaus Marobo

Abstract

Tanzania recognises that investing in early childhood education and care has the potential to offer immense opportunity for all children, regardless of social-economic background, to develop the cognitive, social and emotional skills needed for their development, well-being and success in later life. These capabilities are shaped by high-quality range of developmentally appropriate and contextually relevant pedagogical practices. This chapter tracks pedagogical transformations that have taken place over time, emerging innovative pedagogical approaches and their prospects in marginalised pre-primary education settings in Tanzania. The chapter aims to contribute to the on-going debate about what pedagogical practice works in various early childhood education settings. It is anticipated that the discussion might broaden our understanding of pedagogical practices from marginalised communities. The chapter is organised into six sections. The first section introduces the chapter. The second section presents an overview of the education structure and early childhood education in Tanzania. The third section tracks pedagogical transformations over a historical period. The fourth section presents the new development innovations that have been made in early childhood education in recent times. The fifth section highlights early childhood education pedagogical challenges. The last section reflects on pedagogical prospects for children in marginalised localities.

Keywords: pre-primary education, early childhood education pedagogy, marginalised children, Tanzania

1. Introduction

Tanzania recognizes the importance of the first years of life, between 0 and 8, as the most critical period of development as it is the time when a big portion of the brain development takes place. Every early experience stimulates brain development,

and neglect may impede brain development. This implies that investing in high quality early childhood education and care (ECEC) has the potential to offer immense opportunity and is the right thing to do to every child regardless of social-economic background, to develop the cognitive, social and emotional skills needed for their development, well-being and success in later life [1]. The positive effects of quality early childhood education are translated into academic and life successes that persist over a longer period. In this cognisance the government of Tanzania is committed to ensuring that every child including those from marginalised communities has access to quality early childhood innovative and developmentally appropriate pedagogy and learning experiences. Nevertheless, a huge number of children from marginalised populations such as those residing in geographical challenging and remote areas surrounded by big rivers and forests, areas with seasonal roads, long walking distances from home to school, have limited access to quality early childhood education. In case these children have access to exposure to innovative pedagogy practices quality is an issue worthy exploring. Quality interactive process between teacher and children and both the home and early childhood setting environment shapes children's capabilities regardless of their backgrounds. This chapter discusses a range of innovative early childhood pedagogical practices in marginalised localities. The aim is to contribute to the on-going global debate about what constitute effective pedagogy in early childhood education settings, hence broaden understanding of pedagogical practices from areas that have been under reported.

2. Early childhood education in Tanzania

Tanzania is a forged union of two nations Tanganyika and Zanzibar. Tanganyika became a Sovereign State on 9th December 1961 and a Republic in 1962. Zanzibar became independent on 19th December 1963 as a constitutional monarchy under the sultan and the People's Republic of Zanzibar was established after the Revolution of 12th January 1964. The two Sovereign States formed the United Republic of Tanzania on 26th April on 1964. The name Tanzania is a portmanteau of Tanganyika and Zanzibar. Currently, Tanganyika is commonly known as Tanzania Mainland whereas Zanzibar is known as Tanzania Isles or Zanzibar. The chapter focuses on Tanzania Mainland.

The United Republic of Tanzania is a nation in East Africa bordered by Kenya and Uganda to the north, Rwanda, Burundi and the Democratic Republic of the Congo to the west, and Zambia, Malawi and Mozambique to the south. The country's eastern borders lie on the Indian Ocean. The United Republic of Tanzania is a unitary republic composed of 30 regions. The capital city is Dodoma and the major commercial city is Dar es Salaam. Official currency is Tanzanian Shilling and the national language is Kiswahili whilst English is widely used for official communication.

Since independence, Tanzania has undergone several educational reforms. In 1967, about 6 years after independence, for example, the government of Tanzania adopted the philosophy of education namely Education for Self-Reliance (ESR) to inform educational practices at all levels of education [2]. The philosophy advocates for active learning, linking theory and practice as well as development of critical thinking, inquisitive minds, self-confidence, decision making skills, problem solving, and ability to value humanity and love for work. It has been guiding educational reforms and practices across levels of education and training ever since. Early childhood education is not exceptional.

A variety of terms including early childhood care and education (ECCE), early childhood development (ECD), ECEC, early childhood care and development (ECCD) and early childhood care for survival growth and development (EC-SGD) have been used to describe care and education services for young children. These different terms could be explained by variations in the foci of services and the target age group across the globe. In Tanzania, the term ECE is used interchangeably with pre-primary education (PPE). Nevertheless, two terms namely, ECCE and ECD have dominated to refer to the services for young children from birth to 8 years of age. These services adopt a holistic approach and recognise the interdependence nature of the physical, social, emotional, and cognitive domains of development.

The ECCE in Tanzania is provided through child-care centres, nursery schools, Montessori and other early childhood centres, and pre-primary classes, which are affiliated to primary schools. The focus of this paper is on PPE offered to marginalise children. PPE is fee-free and compulsory 1-year programme for children aged 5 years. The PPE serves as a preparation for primary education. Children aged 3 or 4 years can join only if they demonstrate readiness; ability to be independent, ability to express him/herself, ability to follow simple instructions and interest of a child [3]. In case they are not ready for PPE they can either stay home or enrol in early childhood centres whereby the private sector provides care and education.

Before 2014, PPE was provided for 2 years but the structure of the formal education system was amended to encompass a 1 year of compulsory PPE in a 1-6-4-2-3+ education structure [4]. Each primary school in Tanzania is expected to have a pre-primary class as an addendum. Currently, the total number of pre-primary schools/classes is 18,158 whereby the number of Government classes is 16,355 (90.1%), while the number of non-government schools is 1803 (9.9%). A total number of 25 councils (13.6%) have no non-government pre-primary schools.

3. Pre-primary education pedagogical transformation

Early childhood education pedagogy entails the combination of instructional techniques and strategies adapted to enable teaching and learning activities occur and allow children to acquire knowledge, skills, attitudes, and dispositions. It is concerned with collaboration between children and teachers and interaction with the environment in a shared manner that allows learning to occur [1]. In the realm of early childhood education, interaction is key to sharing knowledge and skills between teachers, children and the environment. The pedagogies are influenced differently from context to context and sometimes from child to child.

Early childhood education in Tanzania has undergone transformations from time immemorial. This has gone hand in hand with pedagogical changes across contexts. Early traditional African societies had no formalised schools; rather education was transmissible from parents and community members to children in schools unchambered by walls [5]. Rites of passage were tailored to specific age groups of children and were taught on how to live in their community. This suggests that 'traditional' education was contextually based [5]. Differences from one society to another existed, based on the environment and cultural norms of that particular society. Education responded to the existing socio-economic, political and cultural practices of the community. The content grew naturally from the environment, and it reflected the demands and requirements of the community it served. This type of education aimed at transmitting cultural heritage and codes of good behaviour, such as unselfishness,

obedience, respect, honesty, and endurance. It was integrated into other spheres of community activities. It was provided on a day-to-day basis throughout the entire life span. The mode of instruction included tales, stories, legends, riddles, proverbs, songs, imitation, with great emphasis placed on learning by doing.

In 1940s through1960s, religious organisations and minority racial groups established schools, namely Bush and Madrassa schools. Christian Missionaries on Tanzania Mainland introduced Bush schools. In most cases, these schools were attached to primary schools but in some cases, they were separate units catering for children before being admitted to formal primary school education. In these schools, children were introduced to reading, writing and arithmetic (3Rs), Bible knowledge and basic knowledge. Madrassa schools, on the other hand, were established by Arabs in Zanzibar and Pemba, and along the coastal areas of Mainland as well as the hinterland along the trade routes used by the Arabs. In these schools, children were taught the Quran, and introduced to Muslim education, culture, and reading and writing of the Arabic Script [6–8]. There were also nursery schools, kindergartens, and day care centres [6]. Despite all these practices there was no policy document to guide the provision of ECCE that existed during this particular period [6–8]. We have little understanding about the mode of instruction. However, one might assume that adults/teachers dominated the instruction because behaviourism theory of learning was dominant by that time [9].

After independence in 1961, pressures from some parents to establish pre-school education for their children erupted. These pressures were influenced by changes in life circumstances and demands on families and communities including the growth of urban centres, and working mothers. These changes adversely influenced traditional socio-cultural child care systems so fast that some form of systematic institutional care, pre-school setting became an avenue for education to a few privileged children [7]. Pre-school education was meant to free women from rearing and provide them with an opportunity to engage fully in the economic activities. Nonetheless, there was no legal framework to inform pre-school and nursery schools practices.

The first Education Ordinance was introduced in 1961. The Ordinance required owners of pre-schools to register them with the Ministry of Education [6]. Four years later, in 1965, the Ministry defined a nursery school to as "one which provides PPE for children who have not yet begun formal education in accordance with a syllabus approved by the Chief Education Officer" (p.12). Nevertheless, there was no nursery school curriculum that was established by that time. It was developed later. Available information reveals that, the Ministry of Education dealt with nursery schools, which were taught by qualified teachers and followed a specific syllabus while the rest were taken care of by the Social Welfare Division. Although the division did not run the nursery schools, it was reported to have been more vigorous in registering the nursery schools compared to the Ministry. The day care centres were managed by different institutions [6]. The Division named nursery schools as "day care centres" and came up with a syllabus for training day care centre staff. The purposes of day care centres were primarily to prepare children for formal education by introducing them to numeration, reading activities and pictures, and to teach Kiswahili to some of the children, especially those from rural areas, whose mother tongue was not Kiswahili [6].

In 1979, the first President of Tanzania, the late Mwalimu Julius Kambarage Nyerere advocated for early childhood education [8]. In his speech to welcome the International Year of the Child, he urged the nation to pay special attention to children's education, nutrition, health, water, clean environment and care. However, little

could be observed in response to Nyerere's pleas as Mtahabwa states, "Despite this promising position statement from the Head of State [Nyerere], the practice virtually remained unaltered" [10].

In 1982, the Makweta Presidential Commission was assigned with a task of evaluating the entire education system in Tanzania. Among others, the commission's report stated the rationale for pre-school education. It recommended/advised a serious treatment of preschool education as a crucial and vital part of basic education. Furthermore, the report recommended to the Ministry of Education to formulate a pre-school education policy to guide activities, curricular, teaching/learning materials, and training of pre-school teachers [7]. The commission's report also recommended that the Ministry of Labour and Community Development and the Ministry of Health had to serve the needs of the pre-school children from 0 to 3 years of age [8]. There were some more promising efforts that were made towards promoting pre-school education between 1986 and 1994. During this time, some pre-school related documents were produced. These documents included Pre-Primary Policy draft paper. This document recommended the establishment of a uniform pre-school education programme. However, this recommendation was not translated into practice [7]. Other documents, which were introduced, included the Guideline for Early Child Education by the Ministry of Education and Culture (MoEC) [11]. Also during this period, Tanzania ratified the Convention on the Rights of the Child [12] and the World Declaration on Education for All of 1990. This means that Tanzania committed herself to adhering to the international policies, which advocate for education as children's basic need and right, and that learning begins at birth. Consequently, a preschool syllabus was developed in 1990 [13].

From this section we learn that early childhood education has long history, from traditional communities through preschool settings established mainly by religious institutions. It has evolved from tradition through 'less' formal. The pedagogical approaches employed could be described as adult-centred through which children were taught community life, general and Biblical knowledge.

4. Formalisation of pre-primary education

From 1995 to 2010 period key issue to this period was the formalisation and systematisation of PPE in Tanzania. Following the production of the Education and Training Policy (ETP) [14], the PPE was declared formal and government's responsibility. The ETP recognises that the first 6 years of life are critical for the development of a child's mental and other personality traits. However, due to economic constraints, the government formalised and systematised PPE in the public education system to cater for children aged 5–6 years. Infants and young children (0–4 years) are cared for and receive initial education both at home and in pre-school centres.

One year after the introduction of the 1995 ETP, the Ministry of Community Development, Women and Children Affairs (MCDWCA) [15] developed the Child Development Policy. The development of this policy was to translate basic rights for children into policy following the ratification of the Convention on the Rights of the Child in 1989 [8]. The Child Development Policy stresses five basic rights of the child, namely survival, protection, development, participation and the right not to be discriminated.

In 2003, the pre-primary teacher education curriculum was developed by the then MoEC (now reconstituted into the Ministry of Education and Technology [MoEST]).

Generally, this curriculum document was aimed at providing teachers with knowledge related to the field of PPE. The release of this document marked a significant achievement at this level of education [10]. Two years after the release of the curriculum document, 10 years after the formalisation of PPE, the Pre-Primary Education Syllabus for pre-primary schools (PESPS) [16] was set in place. The primary purpose of the PESPS was to provide teachers with guidance on what and how pre-primary children should be taught. It suggests different methods and strategies needed to develop children's comprehension on elementary skills necessary for primary school education. Beforehand, teachers relied primarily on their personal and primary school teaching experiences. One could reasonably claim that the release of this syllabus marked a significant achievement in the field of PPE in Tanzania [10]. The release of PESPS was followed by the development of the Curriculum for Pre-Primary Schools in Tanzania in 2005.

This document was generally aimed at guiding the provision of PPE in the country. In 2010, the Tanzania Institute of Education (TIE) produced the Teaching Guide for Pre-Primary Schools (TGPS). The purpose of TGPS is to provide pre-primary teachers with guidance on how to translate the PESPS effectively. The guide points out several issues for teachers to take note of. The syllabus and the guide are subjected to further analysis later in this chapter with a view to providing understanding pertaining to their assumptions and provisions in relation to the teaching and learning of reading Kiswahili, the topic of interest of the current study. The PESPS and TGPS provisions are referred to as curriculum intentions in the context of this study.

Even though Tanzania has expanded compulsory PPE increased demand outstrips supply. Children living in marginalised geographies, remote, rural, poor areas and/ or experiencing disabilities have no or little access to PPE, much less to quality early learning opportunities. **Table 1** presents enrolment trends from 2010 to 2020.

Table 1 shows that PPE enrolment fluctuates year in year out. However, we learn from the data that enrolment has been on a steady decrease from 2016 through 2019.

Year	Enrolment of 5–6 years	Total enrolment	Population 5–6 years	NER	GER
2010	880,207	925,465	2,344,242	37.2	39.5
2011	1,018,895	1,069,208	2,402,848	42.4	44.5
2012	986,945	1,034,729	2,472,530	41.8	39.9
2013	977,533	1,026,466	2,755,525	35.5	37.3
2014	639,080	1,046,369		33.4	36.9
2015	1,019,703	1,069,823		33.3	35.9
Year	Enrolment of 5 years	Total enrolment	Population 5 years	NER	GER
2016	710,556	1,562,770	1,522,519	46.7	102.6
2017	706,597	1,517,670	1,584,846	44.6	95.8
2018	659,773	1,422,868	1,652,223	39.9	86.1
2019	657,912	1,428,719	1,701,572	38.7	84.0
2020	630,335	1,377,409	1,755,061	35.9	78.5
Source: [17–22].					

Table 1.
Pre-primary school enrolment rates 2010–2020.

In 2016 the enrolment was at high rate (102.6% GER and 46.7% NER) ever since formalization of PPE in 1995. This could be attributed to the implementation of fee-free basic education policy. In 2019, however, the GER was 84.0% and NER was 38.7%. This implies that 61.3% of the compulsory 5 years population are not enrolled in PPE.

The World Bank data [23] reveal vast rural population than urban population in Tanzania. For example, in 2017 Tanzania rural population was 36,593,461, while urban population was 18,066,884. In 2018 rural population was 37,293,015, with 19,020,429 urban populations. In 2019 rural population was 37,993,577 while urban population was 20,011,884. Furthermore, in 2020 rural population was 38,691,642 with 21,042,571 urban populations. Significant gap exists between urban and rural areas. Rural children are much more likely to be out of school, and they are also much more likely to be over-age when in school. According to the 2012 census the total population of pre-primary age children were 320,070 in urban and 1,079,400 in rural. Surprisingly, children out of school were 129,370 in urban and 809,080 in rural [24]. A child living in urban areas has more than doubled chances of attending school; nearly 60% 5-year-olds children are in school in urban areas, whereas in rural areas this figure is only 25%. It is indicative that children in rural areas have limited chances of obtaining early childhood education than their counterparts in urban areas.

5. Reaching out marginalised children: pedagogical practices

Children who have no or little access to PPE inevitably arrive at primary school unprepared, resulting in high rates of underachievement, repetition, and dropout in early grades. To progressively deliver on their commitment to achieve Sustainable Development Goal 4.2 in 2030, Tanzanian government together with other stakeholders and implementing partners put in place innovative PPE pedagogical practices aimed at strengthening the access and quality of ECE to all children especially the marginalised.

5.1 Satellite centres

A satellite centre is an initiative, which complements formal PPE. It is located within the community at a distance from a nearby primary school. The satellite centres are means to expand access to pre-primary and lower primary education to children living in remote areas far away from the nearest public primary school, 'mother school'. The centres are community-led in the sense that communities provide the space, support operations, and provide community paraprofessional teachers, but the centres are linked to the closest public primary school. The head teacher from the primary school provides oversight to the school and supports the teachers. In addition, one teacher from early grades from mother school is appointed by the head teacher to provide professional assistant to the satellite centre teacher. Furthermore, the satellite centre may be under the same accreditation with the main school, and share resources or administration but maintain separate budgets, resources, and other governing bodies [25].

The establishment of satellite centres could be traced back in 1995 whereby 35 recognised satellite centres were established. Currently, there are a total of 1302 satellite centres across the country in 26 regions 149 councils. An average distance from mother schools to satellite centres is 8 km. A total of 173,376 children, 88,198 boys and 85,178 girls, were enrolled in satellite centres in 2021 [26]. Classes in satellite centres

ranged from pre-primary class to standard six. Government employed teachers teaching in satellite centres were 980 with an employed teacher children ratio of 1:177, while volunteer teachers were 1523. It is indicated that a total number of permanent classrooms in satellite centres were 2868 with a child class ratio of 1:60.

The pedagogical practice in the satellite centres is informed by the competence-based curriculum (CBC). The CBC builds on the previous Pre-Primary Education Syllabus for Pre-Primary Schools in Tanzania [16], which was developed by TIE, about 10 years after formalization of PPE. The 2005 curriculum was content based in nature. The curriculum introduced pre-primary children to six subject learning activities namely Vitendo vya Kiswahili (Kiswahili Learning Activities), English Learning activities, Arithmetic Learning Activities, Science Learning Activities, Personality and Sports Learning Activities, and Art Learning Activities. Each learning activity has its objectives, and competencies that were to be realised within the 2 years of PPE cycle.

The curriculum advocated for individualised instruction, whereby teachers were at the realm to use their knowledge, skills and experiences in making instructional decisions bestowing on child's ability, age and needs, as well as available resources, and classroom situation. The curricular documents evidenced championship for a child-centred approach to teaching and learning and assumed that teachers possessed prerequisite knowledge and skills to inform their instructional decisions. Specifically, the curriculum suggested teaching-learning strategies such as demonstration, games, songs, drawing, role play, excursion, questions and answers, drama, discovery, discussions, inquiry, poems, project work, nursery rhymes and constructing. In addition, it urged teachers to be creative, and use their ability to obtain and employ developmentally appropriate teaching-learning resources, which stimulate a child's use of multisensory organs. Generally, the PPE curriculum placed the child at the centre of the learning activities. Explicitly, the curriculum stated that: *"In teaching/learning process, the child is the main actor while the teacher is the facilitator to the whole process"* [16]. This highlights the curriculum commitment regarding the child centred pedagogy. However, research has consistently demonstrated that the teacher-centred approach has been dominant, and developmentally appropriate teaching-learning materials largely lacking in classrooms [10, 27]. This could be attributed to the environmental constraints, cultural norms, and behaviourism perspective that an adult is the knower and is expected to impart or transmit knowledge to a child who is passive recipients of the wisdom, knowledge and skills from teachers and adults.

The realities of the changing world requires a curriculum that views a leaner as active participants in the learning activity. Children are becoming more curious, creative and interactive; therefore early childhood curriculum and practices are indispensable of putting learners as subjects to be altered into a more desirable state by methods and materials as well as children's interests and concerns. These are aspects of children life to use as linkages to gain access for delivery of curriculum determined by adult experts. Also, children can be key to understanding what the curriculum should be, in such a manner teachers and children cooperate in determining the purposes and experiences of learning. The 2005 PPE curriculum, however, was silent on which perspectives it lies on. From an observational analysis, it seemed to fall under content based as it was built in ties of behaviourist's beliefs such as; teachers had fully knowledge and children are tabula rasa, so teachers are depositors of skills, knowledge, attitude and competences to children.

The 2016 Curriculum and Syllabus for Pre-Primary Education manifests a competence-based perspective corresponding to constructivist viewpoint, which puts emphasis on enabling a child to develop competences that include knowledge,

skills and attitude. The curriculum has moved away from subject-like content to introducing six competence areas; ability to relate to each other; ability to communicate; ability to care for his/her health; ability to care for the environment; mastering artistic skills; and applying mathematical concepts. These competences are organized on daily routine, which trains children to be organised and orderly. To realise curriculum intention, a total of 194 school days, equally distributed in two terms per year are located for PPE curriculum implementation. Each term consists of 21 weeks. A total of 25 periods, five periods (20 minutes each) per day are located for PPE. Normally, classes commence at 8:00 am through 11:00 am. Thus, a child is expected to spend about 3 hours per day at school. Of the 3 hours teaching-learning activities occupy 1 hour and 40 minutes. The rest of hours are for morning cycle, play and snack, if any.

To realise the intended goal, the curriculum puts emphasis on age-appropriate, individualised instructions, play-based pedagogy, and environment rich in developmentally appropriate materials. The curriculum encourages teachers to employ different approaches and practices flexibly to accommodate the needs of every child in the classroom.

5.2 Play-based pedagogy

Play-based pedagogy has the potential to promoting children's active participation in the learning process that supports interaction with others, self-dependence, flexibility and manipulative habits of the presented learning materials [3, 28]. Furthermore, play-based pedagogy provides children with an opportunity to interact with and explore the environment, socialization, self-understanding, and physical maturity while easing classroom management burdens to teachers [29].

Curriculum emphasis on play-based pedagogy suggests a shift of traditional taught classroom atmospheres where the teacher was in control of everything. Pre-primary classrooms are expected to operate in democratic, self-initiated and active involvement where children autonomy is emphasised. Play-based as a core issue in the field of early years demonstrates significance and relevant for a broad range of policy agents, including national policy stakeholders, educators, ECE practitioners but also parents and, most importantly, children themselves. There are various plays tailored according to the concepts and competences of interests. Both free and guided plays are employed in the teaching and learning. Free play exclusively entails play activities that are freely chosen and directed by children and arise from intrinsic and extrinsic motivation [30]. Guided play refers to an activity initiated by children or adults but follows a particular set of predetermined rules and pattern that a teacher or adult aim to develop [30]. Plays commended in the PPE curriculum and used for teaching and learning activities in pre-primary classes reflect the traditional existed plays adapted from local contexts. Children are expected to participate in outdoor, mostly free play, and indoor learning activities through learning corners, as presented in the sub-sequent section. However, despite of the curriculum emphasis on child-centred and play based pedagogy, teacher-centred instruction dominates, and we know little about learning outcomes as a result of playful activities, and how children are assessed as they engage in play.

5.3 'Talking' classroom environment

Learning is a product of child's natural interactions with the environment, provided that the child is surrounded with environment awash in interactive materials and opportunities for a child to use the materials in an authentic situation. The child

can interact, 'talk' with materials alone or with others and/or in the absence of a teacher. Learning to read, for example, requires an interactive classroom environment rich in print materials. Materials such as pictures of different things, cards, printed letters, syllables and words, and alphabet and picture books. Pictures invite pupils' attention and support learning to read, for example, letters and words. Child's interaction with picture books, for example, supports the acquisition of both receptive language and expressive vocabulary. Likewise, child's exposure and familiarity with books at pre-school level supports the emergent reading and understanding of the concepts of print and concepts about books.

The Curriculum and Syllabus for Pre-Primary Education [3] advocates for development of low-cost and use of developmentally appropriate materials in pre-primary classrooms. Among other things, the curriculum recommends for establishment of learning corners with various learning aids that children can use during the class learning or at their own time according to their interest. The corners suggested including numeracy corner, science corner, home corner, art corner, shop corner, language corner (reading and writing), play corner, and sand and water area, which should be outside the classroom. However, the numeracy, language and play corners must be available in every pre-primary class. Each corner is expected to contain respective materials. These materials can be stuck on a classroom wall or hung.

5.4 Storytelling and learning pedagogical approach

Traditionally, children were told stories. These stories were educative and entertaining. In the evenings, adults and children would seat around the fire whereby an adult would narrate a story. With the emergence of new lifestyle, however, a traditional storytelling culture/practice is fading away. Of recent, a replica of traditional storytelling culture/practice has emerged. Storybooks have been introduced and pre-primary children are told stories that are tailored to promoting competences as defined by the curriculum, the case of school readiness programme (SRP). The SRP was an initiative that was introduced to provide temporary solutions to promote access to children from marginalised communities who would not otherwise have access to PPE due to geographical representation challenges

The SRP programme had three distinctive features; first, use/is a community-based approach supported by existing local government structures. Second, SRP use active learning pedagogy to develop core early learning and development competencies mainly using stories, songs, poetry, drama and play. And also supports the development of effective, low-cost learning aids at both national and local levels. The SRP programme was designed for the 5–6-year-old children before entering standard one. The programme was implemented for 12–16 weeks from September to December, whereby programme activities were carried out for 4 days per week. The programme activities were based on 12 story books and other teaching and learning materials [31–33]. One storybook with only one story was narrated for 4 days a week. Each story was meant to promote pre-primary developmentally appropriate concept.

5.5 Activity workbook to engage parents

Parents are crucially significant (crucial and significant) stakeholders in education particularly for PPE. Parental engagement in their children's schooling and learning is experienced in different forms. These include parents' duty to enrol their 5-year children in pre-primary classes and ensure their regular attendance. Also, it the

responsibility of the parents to ensure that their children have all the school-related requirements such as school uniforms, shoes, and writing materials (exercise books, pencils, and counting objects). The 2016 Curriculum and Syllabus for Pre-Primary Education explicitly mentions, among others, the roles of parents should be; to engage with teachers in creating teaching and learning materials, attend PPE classroom and assist in/with teaching and learning activities, attend school meetings that discuss what lies ahead on children's education agenda. On the periphery of assisting teaching and learning activities in classrooms at school settings, activity workbooks were prepared for parents to read with their children at home.

In addition to prescribed role, activity workbook was introduced by Children in Crossfire (CiC) in collaboration with TIE to engage parents to support the marginalized children learning at home. The CiC is a charity non-governmental registered in Northern Ireland. One of its main funders is Irish Aid. In Tanzania, CiC supports the government to providing early learning opportunities to tens of thousands of children. With Covid-19 onset and nationwide school closures, CiC conducted a rapid assessment pointing to most rural young children missing out on digital broadcast remote-learning programmes given the lack of access to TV, radio, smartphones, and other valid communication devices. CiC worked with the ministry of education (MoEST and PO-RALG) and other stakeholders including pre-primary teachers to develop a print-based PPE activity workbook aligned to National PPE Curriculum, providing simple guidance on play-based learning activities that parents/caregivers who can read and write could facilitate with their young children at home using locally available no-cost resources.

The activity workbook was endorsed by the government and 14,000 copies were printed in phase one to reach all PPE children enrolled in 142 PPE streams across Dodoma, Morogoro and Mwanza regions on Tanzania mainland where CiC programming is being implemented. Both the National and local government authorities oversaw the dissemination and orientation of PPE teachers and parents of PPE children across all schools to ensure adequate risk mitigation procedures in the Covid-19 context. The workbooks were distributed to all parents along with a basic learning kit to assist children to start learning at home when schools were closed.

The workbooks became popular, with parents/caregivers confirming the activities were practical for them to lead with their children and stimulate playful learning experiences at home using materials locally sourced. The workbook is currently being certified as a curricular resource through the TIE. Moreover, it has been adapted into large font, tactile, and braille formats for children (with visual impairment) who are visually challenged. So far, 100 large print books and 90 braille formats have been printed and disseminated to parents/caregivers with children visually challenged.

Importantly, with the reopening of schools, parents and PPE teachers continue to embrace the workbook, bringing closer together both teachers/parents and schools/homes in supporting a PPE child's learning. An additional 16,000 other workbooks have since been printed/distributed to PPE children/parents of Dodoma region to support young children's learning reaching 30,000 workbooks in total.

6. Challenges inhibiting pedagogical practices

6.1 Teachers vs. parents' 'antagonistic'

Teachers and parents have differing expectations on what to expect from a PPE particularly on the usage of play as a method of teaching. Teachers might be aware

and would want to employ play-based instruction with a belief that it promotes child's holistic development. Contrarily, parents might not be in the same space with teachers based on the assumption that play is wastage of time. Consequently, teachers opt to comply with parents and employ methods other than play.

6.2 'Ill-defined' classroom environment

The context and environment within which teachers work, and the problems or uncertainties they encounter are 'ill-defined'. The problems or uncertainties include but not limited to lack of play materials, big classes, and high teacher-pupil ratio. Experience reveals that these problems are perennial as such they constraints teachers from engaging pupils actively. For example, PPE delivery is characterized by classrooms that have doors that cannot be latched, broken windows, broken floors full of dusts, classrooms unable to retain displays, school buildings prone to be flooded by intensive rains, swept away by high winds, classrooms exposed to hazardous materials such as sharp and broken desks and limited maintenance. The poor infrastructures both indoor and outdoor imperatively pose challenges in both teaching and learning, making it harder for children to acquire the intended goals.

6.3 Lack of qualified teachers

Majority of the available teachers in satellite centres are not well trained. A worst-case scenario can be traced from innovative programmes in marginalised areas whereby, centres are run by paraprofessionals who have obtained partial trainings that enable them implement teaching and learning activities. Teacher-pupil ratio in PPE setting is unfavourable. In 2020, for example, an average qualified teacher-pupil ratio in public pre-primary classes was 1:193. High teacher-pupil ratio can negatively influence how much time a teacher can spend per child. With a higher number of children per teacher, implementation of play-based activities, and individualised attention and interaction with children are compromised. Thus, the teaching and learning activities are doubtful meeting the standard quality of PPE delivery in Tanzania.

It is unquestionably that early childhood education has admitted pedagogical transformations from time immemorial. The transformations have given birth to numerous coinages all purposely to ensure children's interest is met. Particularly, the pedagogical transformations deliberately settled the access question especially for children from marginalised areas. The transformations signal an ever-changing nature of human beings and practices. Notwithstanding some tensions exist between curriculum pedagogical provisions and practices. These could be explained by perceptual antagonisms between teachers and parents, ill-defined classroom environment, lack of qualified teachers, resource constraints, and diversification of the communities where PPE is offered. To a greater degree these hinder the innovative pedagogical practices as prescribed by the curriculum to curb quality equitable PPE. Diversification of PPE setting calls for a curriculum and a fluid approach with a mix of pedagogical practices. A potential room for innovation is available if at all the best interests of children are put forward. Learning from the former transformations the fate of marginalised children in accessing quality PPE can be held. The next section reflects on the pedagogical prospects in early childhood education.

7. Early childhood pedagogical prospects in Tanzania

A few would dispute that early childhood education pedagogy has undergone significant transformation from adult/teacher centred to child-centred pedagogy with an emphasis on play-based approach. The advocated PPE pedagogy is commendable, developmentally appropriate and likely to persist over the coming years. However, the pedagogical transformation is more visible from curriculum perspective than on actual classroom instructional practices. This could be attributed to several factors including 'ill-defined' PPE settings. Furthermore, traditional pedagogical and values have been implicated in a way in contemporary teaching and learning activities. Children from marginalized communities, however, are at a disadvantageous continuum compared to their counterparts.

The room for improvement is always open if at all individuals are striving to make a difference in the quality delivery of the service. Thus, modus operand for quality delivery of PPE is needed on board. While maintaining child-centred and developmentally appropriate approach children from marginalised populations ought not to be left behind. Henceforth, a need to adapt practices to accommodate increasingly diverse needs of the PPE population is paramount.

Furthermore, the PPE need to keep pace with a world in which knowledge is rapidly expanding, communication technologies are broadening access to information, and, as a result, the skills needed by children are constantly changing or being invented. One of the education delivery mode expected to reach more children out of school and those in marginalised population is the use of Information Communication and Technology (ICT) based instructions including self-learning through electronic gadgets such as; tablets, computers and mobile phones (smartphones). The world is changing rapidly, and knowledge's are so much available cheaply to whoever desires to have them through books, which are vastly produced, networks and internets that takes much of our time nowadays.

The PPE sub-sector is no exception of the changes happening in the world of knowledge. Therefore, PPE requisites to extract this knowledge and transform to children levels. The PPE curriculum should encourage children learning ability in the challenging environments of vast information that some are not liable to children level of understanding and development. Currently, many children especially in town access social media and are on Facebook, Instagram and Twitter. The development of open source and scalable software applications to promote children's literacy and numeracy could cub the need for children learning. Accordingly, the PPE should see this as an impact to its effectiveness because children are so much confused with the vast knowledge's they encounter at school and at home, so as the world is changing and technological advancements are taking cause, abreast update on the PPE is inevitable. The concern for this is on remoteness whereas; some areas still do not have access to electronic and gadgets. In this context, a need for cost and time effective ICT solutions to address the learning crisis of out-of-school children in Tanzania and the world need to be sought, noting the innovative features inherent to a household based self-learning programme for children with the support of immediate adults.

Furthermore, a strengthened partnership between public and private entities promises a linkage for children who obtain PPE in private with those at public schools and centres. Evidence reveals that, children transitioned from satellite and SRP centres to formal schooling are successfully adjusting into the system. Consequently, with a strengthened partnership successful transition is guaranteed. However, it should be

noted that, most of these children are coming from marginalised families. There is a need for the government in collaboration with other stakeholders, to find a mechanism to support successful beneficiaries who have joined formal education from marginalised populations to stay in schools. Besides, a need to improve satellite centre teacher qualifications, development of integrated curriculum and quality monitoring processes cannot be underestimated.

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Author details

Richard Shukia* and Stansilaus Marobo
University of Dar es Salaam, Dar es Salaam, Tanzania

*Address all correspondence to: richardshukia@gmail.com

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Chapter 17

Becoming an Expert *on Purpose*: How Deliberate Practice Informs Teacher Effectiveness

David G. Grant

Abstract

The call for teacher improvement has long been advocated in educational circles. Hargreaves & Fullan asserted it takes 8 years to reach the highest level. The important direct relationship of teacher effectiveness to student achievement was summarized by John Hattie. Many pathways to developing teacher effectiveness have been explored. A unique body of literature exploring expertise and it acquisition led to the articulation of deliberate practice theory with application in the domains of chess, music, medical training, and professional domains. Although a robust set of reviews have synthesized knowledge of deliberate practice in other domains, a comparable review could not be found in the field of education. Therefore, this chapter synthesizes the literature applying deliberate practice theory to the cultivation of teacher effectiveness.

Keywords: teacher effectiveness, instructional expertise, deliberate practice, pedagogy, instructional coaching

1. Introduction

The importance of effective teachers cannot be underestimated. Indeed, stakeholders such as students, parents, and principals wholeheartedly agree on this need. Current literature confirms that the highest levels of effectiveness for teachers come after 8 years and begin to diminish after 23 [1]. Nevertheless, there are some teachers within the profession who "...will still not settle for *relatively effective teaching*. They will deliberately and frequently engage in activities to improve their teaching" [2]. We seek to foster continuous self-improvement of teachers' instructional expertise.

Instructional expertise refers to the effective use of pedagogical content knowledge [3] and related skills by teachers resulting in visible learning outcomes for students [4]. A unique body of research has explored elite expertise and its *acquisition* leading to the articulation of deliberate practice theory [5, 6] and subsequent application in multiple domains including chess, music, medical training, and professional domains [7]. Literature reviews have synthesized findings in medical training, music, and psychology [6, 8, 9]; however, no systematic literature review could be found applying deliberate practice theory in the domain of K-12 teaching.

Therefore, this chapter synthesizes current research applying deliberate practice theory to the development of K-12 teacher instructional expertise. The article

describes historical antecedents in the general study of expertise and then explains deliberate practice theory, concluding with three questions pursued in this chapter. Section two describes application of this theory to educational research. Section three describes methodology. Section four synthesizes findings for the characteristics of deliberate practice, constraints to the process, and outcomes found in the literature. Section five discusses the implications for research, policy, and practice. The final section concludes the chapter.

1.1 Historical antecedents in the study of expertise

Early modern assumptions of expertise were altered in 1869 by Sir Francis Galton. Prior to his study of expertise, it was assumed that eminence in any domain was fully explained by natural ability. Galton's tripartite theory retained a belief in innate talent but added to this the dimension of zeal and the power to do laborious work. In Galton's words, "If a man is gifted with vast intellectual ability, eagerness to work, and power of working, I cannot comprehend how such a man should be repressed" [10].

Alternative scientific accounts of expertise development have been proposed. Study of research scientists found the average age of first publication was 25.2 with greatest work published at age 35.4, a period of 10.2 years [11]. The study of chess grand masters led to a similar specific period of practice to achieve eminence, i.e., ten years practice or more to become a chess grand master [12]. Bereiter and Scardamalia [13] posited expertise as a process, rather than a state of being, something experts do over and over thereby becoming and remaining experts; they look for and take on increasing challenges in their domain. In this context, a theory of deliberate practice was published in 1993 synthesizing nearly a century of research on expertise and reporting data from two new empirical studies in support of this theory [14].

1.2 Deliberate practice theory and educational literature

Deliberate practice is a unique type of practice that is purposeful, systematic, requires focused attention and is conducted with the specific goal of improving performance. Two studies of musicians found that practicing alone with a focus on self-improvement was the activity rated most relevant by elite musicians as contrasted with performances and playing for fun [14]. Indeed, it is possible to analyze the vital factors that mediate eminent performance in other domains [15]. Eminent scientists have high rates of publication; they deliberately develop and refine ideas through thinking and writing. Manuscripts go through many revisions and the peer review process offers feedback. Elite runners deliberately develop muscle using interval training and less time in long moderate runs that offer the "runners high." In the domain of chess, deliberate practice consists in the hours spent studying published games of chess grandmasters seeking to predict the next move of a master; this type of practice was contrasted with playing games in tournaments or for fun [16]. Another example focused on improving student achievement by applying deliberate practice to students. The critical factor for such practice was structuring students' study activities, so that students obtain specific, timely, and reliable feedback regarding their progress [17]. Moreover, Dunn & Shriner [2] found strong support for using the deliberate practice framework to understand the development of expertise in the ill-structured domain of teaching. In sum, deliberate practice theory has over three decades of research in multiple domains with extensive empirical support for applying deliberate practice to improve teacher instructional expertise [18].

Educational research on the development of expertise confirms deliberate practice theory's prediction that it will take much longer than a typical one-year teacher education program to develop expert ability. Shulman's theory [3], pedagogical content knowledge, has greatly influenced generally accepted notions of what instructional expertise ought to be described as for teachers. To be an expert, a teacher must acquire expert knowledge of their content, expert knowledge of pedagogies relevant to their content area, and the expert judgment to apply such knowledge with the student population they are teaching. Indeed, a long-term synthesis of meta-analyses in educational research found effect sizes for a wide range of practices; however, the big idea emerging was that effective teaching is visible to students and student learning outcomes are visible to teachers [4]. Therefore, we include outcomes in the working definition of instructional expertise. Instructional expertise refers to the effective use of pedagogical content knowledge and related skills by teachers resulting in visible learning outcomes for students. Consistent with deliberate practice theory [14], we expect instructional expertise to be the outcome of prolonged intentional efforts by teachers to improve.

Many studies since 1999 sought to apply deliberate practice theory in K-12 teaching. Whereas chess masters study published games, deliberate practice for teachers occurs in an ill-structured domain where many different teacher quality goals are relevant. As such, deliberate practice for teachers is a self-improving approach to goal setting, instructional practice, feedback seeking, evaluation and decision making related to new goals. Often there is a shift from task design by a coach to self-improving goal setting, from directed practice alone to self-improving instructional practice with students, from receiving feedback from a coach to seeking self-improving feedback from multiple sources, and evaluation as reflection for self-improvement.

Four characteristics are essential to deliberate practice. A practice task with a well-defined goal is designed by a coach for self-improvement. The next dimension, feedback, is crucial to positive impact. Feedback needs to be immediate and informative in response to the practice thus enabling the learner to use the information for self-improvement. Third, reflection on both feedback and practice informs future deliberate practice. This cycle of self-improvement is repeated with intensity over time leading to incremental improvements.

Three constraints may limit deliberate practice. This type of practice requires significant motivation and effort as it is not inherently enjoyable, provides little external reward, and is difficult. The continuous cycle of growth requires full concentration, evaluation, and applying new strategies to improve performance. As well, motivation and effort must be supported by a third constraint, environmental factors. Deliberate practice is supported or hindered by availability of resources such as time, tools, and financial costs related to coaches, experts, and training (**Figure 1**).

The following research questions guided this systematic review the literature applying deliberate practice to teacher instructional expertise:

1. How have the characteristics of deliberate practice been applied to improve instructional expertise in K-12 teaching (e.g., task design/goal, informative feedback, reflection, and repetition)?

2. How have the constraints of environmental factors and individual motivation impacted deliberate practice in the K-12 teaching context?

3. To what extent does the expected outcome of deliberate practice (i.e., instructional expertise) occur in studies of K-12 teachers?
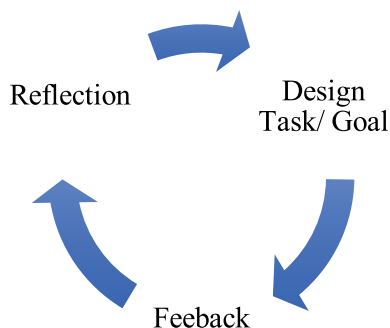
Figure 1.
Deliberate practice intensively repeated.

2. Methodology

The purpose of this study was to synthesize research findings of deliberate practice for K-12 teachers. Search terms were derived from a review of the literature on deliberate practice theory. Final criteria included (1) peer reviewed studies utilizing deliberate practice with K-12 teachers, (2) studies in which deliberate practice was the interpretive lens, (3) and studies that made a unique contribution to deliberate practice knowledge in the ill-structured domain of K-12 teacher expertise. These criteria excluded non-peer reviewed works, editorials, essays. This filter also excluded studies and literature reviews of DP in other domains (medical, music, sociology, human resources, higher education, students, etc.). The primary search term was deliberate practice which combined with secondary terms (goals, feedback, motivation, education, and instruction). The following databases were searched: ERIC, Academic Search Premier, PsycARTICLES, PsycINFO, Social Sciences Full Text (H.W. Wilson), and Google Scholar.

Initial search of peer reviewed studies with deliberate practice in the abstract produced 644 citations. "Deliberate practice" and "education" produced 325 citations. Combination searches were conducted with "deliberate practice" and "motivation," "goals," "instruction," and "feedback," producing 79 citations. New citations were added to the list and duplicates were eliminated.

All titles were reviewed to ensure relation to deliberate practice and K-12 teachers. Articles by Ericsson and literature reviews not directly focused on K-12 teachers were removed. Articles were eliminated that were editorial, essay, or specific studies in other domains. Literature reviews of DP in other domains were removed. This process resulted in 46 citations. Abstract analysis was employed to determine if deliberate practice was the theoretical framework for design and interpretation. Articles advocating deliberate practice strategies for teachers that were not empirical studies were removed. There were seven studies remaining that met all criteria. Google Scholar was used to identify and review studies citing these seven, a forward-looking check for articles meeting criteria. Two additional articles were found meeting all criteria. All articles were read through for confirmation. The final sample included nine studies published from 1999 to 2019.

Each study was read a second time for systematic analysis. Factors of deliberate practice were used to code relevant details of each study. Findings for each factor were comparatively analyzed for similarities, differences, and insights informing the research questions for this study. An overview of studies is provided below, followed by result of analyses presented in an integration of findings.

2.1 Overview of studies 1999: 2019

Nine studies since 1999 studied instructional expertise for teachers through the lens of deliberate practice including a third from Europe, North America, and Asia, respectively. Quantitative, qualitative, and mixed method designs were employed. Studies as a group confirm the empirical usefulness of deliberate practice.

Dunn and Shriner [2] found planning and evaluation to be core deliberate practices. In contrast, although Hashim and Ahmad [19] confirmed the importance of preparing and evaluation, their study of expert educators reported two activities not associated with deliberate practice including number of hours in daily teaching and extracurricular activities. As well, König, J., Blömeke, S., & Kaiser, G. [19] cited teaching time alone as deliberate practice. Although teaching time is prerequisite to instructional practice, deliberate practice theory predicts teaching time alone is an insufficient explanation for eminent ability. Other researchers noted that since all teachers engage in most or all of these activities, a factor unique to self-improving teachers must explain the difference; this difference was termed teacher approach [2]. Adding support, Bronkhorst et al. [20] identified 63 activities meeting designated criteria for deliberate practice but found no significant difference between these activities relative to other activities. However, differences were found for the outcomes of these activities. Thus, the study supports Dunn & Shriner [2] in suggesting approach, rather than mere participation in the activity, distinguished teacher activities as deliberate practice. Bronkhorst et al. [21] found stronger descriptions of teacher deliberate practice reporting one group of experts who described deliberate practice as the enactment of teaching (i.e., put into practice one's intentions) while other experts described deliberate practice as regulation, (i.e., reflection on one's own learning process & seek self-improvement). Another study focused on instructional practice using micro lessons [22]. Finally, public lesson study highlighted teacher lesson planning with specific goals, rehearsal of instructional practice, feedback (from students, peers, and experts), and active evaluation with decision making [23–25]. Thus, public lesson study provided the most complete explication of deliberate practice.

3. Research question #1 characteristics of deliberate practice

3.1 Task design- self-improving goals of teachers

The task/goals of planning and evaluation to improve student outcomes were common in two studies of in-service teachers [2, 24]. A more recent study did not name specific tasks but implied teacher goals to motivate students and manage disruptive behaviors [19]. Studies of DP through Chinese lesson study [23–25] identified explicit teacher goals including 1. mathematics task design, 2. planning to teach a difficult math concept, and 3. using mathematically, pedagogically appropriate language. Notice that teacher goals included designing a task for students (student goal), how to practice (instructional practice, teacher goal), and use of language (enactment of content knowledge, teacher goal). Studies of expert teacher educators found two goals driving practice: improved student performance and increased teacher knowledge. Bronkhorst et al. [21] notes themes from the design principles that link with deliberate practice goals. The design of teaching is like the planning noted in studies of in-service teachers. Expert educators note three broad goals they have for student teachers- meaning oriented learning, enactment of effective teaching, and regulation of

reflection. It is reasonable to infer student teachers will have specific goals for lessons that influence the range of deliberate practices they engage in. Hashim & Ahmad [26] reported expert learning goals such as studying in London and long-term performance goals (e.g., promotion to trainer, mentor, and "excellent lecturer"). Note that performance goals do not fit the definition of deliberate practice but may motivate teachers to engage in a range of activities. Anderson et al. [22] did not provide explicit goals for self-improvement, yet the characteristics of task design were implied in descriptions of lesson planning. Based on the responses of pre-service teachers, I note three implicit goals: 1. to engage the interest of students, 2. effectively present the lesson, and 3. influence student understanding of content. Bronkhorst et al. [20] used three characteristics of deliberate practice as criteria for identifying student teachers' learning activities as deliberate practice. Student teachers identified 249 activities as "purposefully designed." Evidence was lacking to indicate these were designed by an expert for teacher self-improvement as in Chinese public lessons. Non-deliberate practice goals included performances such as final public lesson and promotion goals.

3.2 Feedback

Three studies of in-service teachers implied students are a source of feedback to teachers who give attention to the cues. For König et al. [19] feedback can be viewed as cues coming from student displays of motivation or disruptive behavior while Dunn & Shriner [2] find student *learning* outcomes (e.g., teachers test, projects, district assessments) are a source of feedback. However, a key difference in the public lesson study was the salience of informative and critical feedback by "knowledgeable others," focused on three highly specific goals [23–25]. The types of feedback cited in public study included providing rationale, strategies, correction, questions, validation of practice, description, and suggestions for change. Both Dunn & Shriner [2] and Chinese lesson study [23–25] highlighted dialog with peers but public lessons offered greater structure for peer feedback and included expert feedback. Such feedback was informative of strategies and provide corrective input on practices negatively impacting student learning. The Malaysian study had very sparse examples of such feedback [26]. On the other hand, the Netherlands study identified expert articulation of student teachers' theories as unique and important feedback [21]. As well, teacher educators' facilitation of student teacher self-evaluation raised awareness- another important source of feedback. Both studies included student teacher supervisors implying feedback is central to developing instructional expertise; however, the information, strategy, or corrective nature of such feedback was missing. This limited an important connection with the deliberate practice model. In contrast, student responses during the lesson as well as after the lesson were important feedback cues. This type of indirect feedback is similar to findings by Dunn & Shriner [2] and König et al. [19]. Preservice teachers received feedback from context (time was up before they were ready), student reactions (interested, enjoying the lesson), and student outputs (more correct answers) [22]. Student teaching supervisors provided feedback of "already been noticed." The study also included feedback from peers [20].

3.3 Reflection-revision, evaluation and decision making

Reflection was evident or implied in most studies and, at times, synonymous with evaluation of teaching. However, reflection was not addressed in the German study [19]. Again, public lessons stood out as distinguished from general teacher

reflection [2, 24, 25] in that all members of teacher research groups (TRG) participated in the reflection including reflection on teacher performance during the lesson. The reflection characteristic was a salient theme among expert educators [21, 26], which led to revisions of task design, mathematical representations, task sequence, time sequence, and activity design.

Reflection can be inferred from Anderson et al. [22] based on student teacher comments regarding micro-teaching concerns, e.g., initial concerns with pacing. Bronkhorst et al. [20] did not collect data on active reflection of student teachers. Studies provided data supporting *types* of reflection including evaluation of student feedback, dialog on expert feedback, self-evaluation, and exploring revision or improvement possibilities with peers, experts, or supervisors.

3.4 Intense repetition

Repetition of the planning-evaluation cycle was common to four studies [2, 23–25] and can be inferred from the teaching time variable that predicts interpretive ability of teachers [19]. Public lessons were unique in the focus on rehearsal and repetition. Two studies included three cycles of Chinese lesson study [24, 25]. Rehearsing the lesson with various groups of students with critical feedback was more effortful for teachers and receiving critical feedback was not inherently enjoyable [23]. Repetition was implied in the described practices of expert educators (i.e., design- reflect- evaluate) [21, 26]. Although repetition was a criterion and reported activities included a plan to repeat, it is unclear whether repetition was linked with incremental self-improvement goals. In contrast, Anderson et al. [22] included an initial micro lesson with three repetitions making its impact more visible.

4. Research question #2 constraints of deliberate practice

4.1 Environmental constraints

Findings were context-specific and indicate that teachers who are provided job-embedded opportunities for planning and evaluation have greater opportunity to deliberately improve instructional expertise [2, 23–25]. Environmental factors impact how much teaching time teachers have. Thus, König et al. [19] suggest that leaders secure the maximum teaching time. This makes sense for students implicitly, but study data found that teaching time predicted 10% of expertise in interpreting classroom situations depicted in video vignettes. Chinese lesson study [23, 24] was supported by environmental infrastructure and a long tradition of public lessons in China. All aspects of deliberate practices were job embedded, included in the evaluation system, culturally supported, and for at least one teacher participation was directed. Even when this process was implemented in the United States, there was support from university professors, experienced educators, and time to engage in repeated teaching, reflection, and revision [25]. Such environmental factors deserve careful review prior to implementing in different cultural contexts.

4.2 Motivational constraints

Motivation was expressed as *mindfulness* and *effort* during planning and evaluation activities; these were found to be the essential difference for teachers optimizing

growth in instructional expertise [2]. Although effort and motivation to participate were assumed as part of the cultural context of public lessons, the response to feedback contrasted sharply. For example, teacher one resisted feedback leading to confusion among students in the public lesson while teacher two accepted, applied, and even sought out new strategy feedback leading to noteworthy improvement in the public lesson. Note that teacher two persisted through five rehearsal cycles (compared to one cycle for teacher one), another indication of strong motivation. The study provided thick description of feedback and suggests that response to feedback and feedback seeking may be a proxy for teacher motivation for self-improvement [23]. Two additional studies of Chines lesson study were conducted allowing volunteers [24, 25]. In each study motivation appeared to be strong, a confirmation that this approach is more efficacious with educators who have a mental model of self-improvement.

Differences in teacher response may link with Dunn & Shriner's [2] finding that some teachers are more mindful in planning/evaluation than others indicating that variance in self-motivation creates variance in acquisition of expertise. König et al. [19] found that task demand/challenge by students (i.e., motivating students & managing disruptive behavior) predicted teacher profile with an explanatory power of 20.7%. Analysis generated a paradoxical finding that higher skilled teachers report higher motivational and behavioral challenges from students. Their findings raise the possibility that such problems motivate teachers to experiment with new strategies thus leading to higher levels of expertise [19].

4.3 Linking environmental and motivational factors

Insights from expert teacher studies offer additional insights. Bronkhorst et al. [21] links individual motivation and environmental factors. The environment described includes active modeling of expert educators for their student teachers, active facilitation for the deliberate practices, alignment of student teacher conceptions with expert educators' conceptions, and a combination of self-evaluation with expert educator evaluation. Thus, an environment with support and aligned accountability fosters conditions for self-improvement of student teachers. Hashim [26] noted essential self-motivation and environmental supports. The environment they worked in included administrative support which led to unique opportunities to further develop knowledge and skills. Experts noted that such support was costly financially and limited to teachers demonstrating self-motivational individual values. Expert educators reported individual values of self-direction, a committed attitude, a firm work ethic and persistence. Experts note they were also socially motivated by peers. Moreover, these supportive learning experiences paved the way to leadership opportunities as trainers, mentors, and eventually to promotion as "excellent lecturer" by the ministry of education. Note the interaction effect of individual motivational factors with environmental factors leading to recognized expertise.

Environmental factors influenced student teachers in both studies of preservice teachers. Small group size (5–7 fourth grade students), varied classrooms, a limit of 35 minutes, and university instruction in social studies pedagogical content knowledge combined to influence repeated lessons [22]. Environmental cues such as "already been noticed" were cited as influential feedback [20]. As well, both studies found student teachers were motivated to self-improve *to improve student outcomes*. Anderson et al. [22] notes dimensions of teacher performance (i.e., pacing, gaining student interest) were important to motivation. These findings are consistent with studies of Chinese lesson study [24, 25]. In contrast, Bronkhorst et al. [20]

incorporated "motivated in some way" as a fourth criteria in identifying 308 student teacher activities while only 63 met all criteria as deliberate practice. In sum, preservice and early career teachers may be considered as novices who are influenced by their environmental context and motivated by factors that differ from expert teachers. However, the motivation for self-improvement seems to transcend differences in experience, skill, content area, and culture. More research on the motivation for self-improvement is warranted.

5. Research question #3 outcomes of deliberate practice

Educational studies of deliberate practice build on prior studies of elite performance. Prior studies used retrospective interviews and experience logs to investigate elite and good performers. Analysis of type of practice, frequency of practice, total daily/weekly practice, and total accumulated practice were conducted. Therefore, it was essential that the study of expert performance begin with *true experts*. Researchers could then empirically investigate whether differences in expertise were best explained by innate characteristics, type of practice, amount of practice, or some combination of these factors.

Experts in the domains of chess (i.e., chess grandmasters) and music (i.e., international philharmonic orchestra members) demonstrate elite expertise with clear outcomes. We make the causal assumption that A (deliberate practice) causes B (gain in ability). Studies of instructional expertise reported impact on teachers' instructional practices and on student outcomes. Deliberate practice for teaching (A) improves instructional practice (B), which in turn influences student achievement (C). However, other factors *could* influence student achievement. Thus, while deliberate practice has a direct effect on instructional practice, it has an *indirect* effect on student achievement. Studies reported both types of outcomes, albeit without using statistical methods (i.e., path analysis) which could measure such effects. Such research is recommended.

5.1 Three positive outcomes

Deliberate practice produced moderate direct qualitative results on a range of teacher instructional practices. Dunn & Shriner [2] found that experts change strategy when students are not learning, learn more from deliberate practice activities due to their *approach*, and make changes based on informal evaluation of student behavior [2]. König et al. [19] predicted the outcome of teaching time to be increased skill in interpreting classroom situations; a form of instructional expertise. As these skills were measured using video vignettes of actual classroom situations, we infer this outcome relates to teacher reflection-in-action [27], consistent with Dunn & Shriner [2]. More specific teacher improvement outcomes occurred in public lessons including improved instructional expertise in task design, teaching difficult math concepts, and using mathematically appropriate language. These outcomes occurred the primary level [24], upper elementary level [24], and high school level [25].

Contrasting outcomes occurred in one study of teacher performance because one teacher resisted feedback leading to confusion for students while another teacher accepted and used strategy-oriented feedback leading to "remarkable improvement in her attempt to teach the difficult idea to the first graders" [23]. Thus, outcomes of deliberate practice resulted in improved teacher performance which impacted positive student learning outcomes.

Response to feedback appears to mediate the effects of deliberate practice with expert feedback. Pre-service teachers using deliberate practice improved efficiency of instruction and increased pedagogical content knowledge for social studies [22]. Expert teacher educators reported that student teachers increase their efforts for self-improvement, instructional effectiveness, and experience greater success when they engage in deliberate practice [21].

Student outcomes varied significantly, and studies provided mainly qualitative support for the influence of deliberate practice on student achievement. Anderson et al. [22] found students produced more correct answers because pre-service teachers used deliberate practice. Expert educators reported that deliberate practice for student teachers resulted in improved student outcomes [21] but specific data demonstrating this connection was absent from the study. One clear example of student achievement outcome was improved student learning on a government geography exam resulting from expert use of a new strategy [26]. Evidence to date suggest that a clearly defined outcome for students is likely to be impacted through deliberate practice, but such outcomes are micro in nature. It may be possible to improve outcomes that are tangential or of secondary importance. More research is needed to investigate the indirect effects of deliberate practice on student achievement outcomes, including quantitative measures which can be allow inferences to a larger population.

The evidence from the study of deliberate practice with K-12 teachers demonstrate its potential to produce improvements for self-selected skills deliberately practiced by teachers. However, the decision of *which* skills are practiced and improved may alter significantly whether student achievement is improved.

6. Discussion

Each unique characteristic (task design, feedback, reflection, sustained repetition) and constraint (environmental resources and individual motivation) of deliberate practice theory is empirically supported in research literature and all characteristics were demonstrated in the Chinese public lesson. Challenging goals (task design) increase the effectiveness and need for feedback [28]. When goals are too easy, feedback is not needed. However, when goals are designed with sufficient challenge, feedback is essential to success. This process was illustrated well by the Chinese public lesson process. Feedback by a knowledgeable other, related to these goals, influences reflection, revision, and outcomes. Indeed, meta-analyses demonstrate that the effect size for feedback with students was 0.72 [4, 29]. Given the support for each factor of the deliberate practice model, I suggest that deliberate practice provides a useful heuristic for continuous-improvement of instructional expertise by K-12 teachers. Future research will be needed to confirm and quantify such value in developing teacher quality.

Several limitations emerged in this systematic review spanning 1999–2019. First, studies in this review used number of years (i.e., 10, 24) and recommendations of others (peers, ministry of education) as a key indicator of expert status. These measures are not trustworthy predictors of student achievement and, therefore, of elite performance. Second, sample sizes of most studies were very small, and none were randomly selected. The sample selection limits generalizability of findings. In addition, only two studies explored deliberate practice with in-service teachers at the secondary level and there were no studies of secondary teachers with the minimum experience of ten years suggested by deliberate practice. Finally, this study

consistently found teacher *approach or self-motivation* to be the difference between teachers engaging in deliberate practice compared with those who do not, or who resist the process. However, no scale was developed to measure the construct of self-improvement motivation.

Therefore, several research recommendations may help in the process. First, I recommend investigating the indirect effects of deliberate practice on student achievement outcomes. Second, research is needed to explore the deliberate practices of *self-improving secondary tenured teachers.* Specifically, researchers need to explore teacher practices for those who *do not need to improve* yet aggressively seek self-improvement. Third, future research needs to develop and test a scale that can measure the construct of *teacher self-improvement motivation*. Research can then study factors that predict the construct in K-12 teaching as well as outcomes that can be predicted by the construct.

Policy makers may aid this journey in a few strategic ways. First, recent research on integrated leadership identified practices that foster "community learning," one of two functions predicting teachers with high effectiveness and high morale [30]. Evidence from 20 years of research on deliberate practice for teachers provides complementary evidence for how we cultivate teacher instructional expertise. Therefore, policy makers should fund and support policies and regulations that institutionalize job-embedded professional learning communities. In addition, policies for teacher professional development need to consider additional small-scale implementation of Chinese lesson study as a means of deliberate practice.

Professional practice begins in our schools of education and continues into our schools and districts. Therefore, teacher training programs need to embed deliberate practice as a means to develop and sustain improvement in teaching instructional expertise. Principal training programs need to guide principals in how to support community learning as the primary work of teachers and staff in a school. Finally, instructional coaches, mentors, and specialists need to apply the principles of deliberate practice as they seek to support ongoing improvement of teachers in schools.

7. Conclusion

This chapter presented a challenge, an invitation to teachers into a long-term journey toward the highest levels of expertise. In a profession in which large numbers leave the profession or promote within five years, we are not experiencing the highest levels of performance for all teachers. Concurrently, the pressure on teachers for results has invited resistance. It remains for leaders, teachers, policy makers, and researchers to collaborate on improving the conditions in which all of us work while simultaneously taking the next step to motivate teachers within our respective contexts.

Author details

David G. Grant
University of Redlands, Redlands, CA, USA

*Address all correspondence to: david_grant@redlands.edu

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Chapter 18

Children's Art Exhibitions in Brazil: A Modern Badge for the New Man

Dulce Regina Baggio Osinski and Ricardo Carneiro Antonio

Abstract

In this article we analyze, within the context of the decades between 1940 and 1960, children's art exhibits as a strategy for asserting the importance of Art in educating and developing a child's personality, using newspaper articles, pictures, children's drawings, reports and other institutional documents as sources. The artistic vanguards of the early 20th century, advocates of the artist's self expression, and the acknowledgement – by Psychology and Pedagogy – of the specificities of being a child have resulted both in the defense of the child's freedom of artistic expression, and in a renewal of Art and education concepts of that period of time. As of the mid '40s, children's art caught UNESCO's attention because it represented potential integration and fraternity among people and the desire to build a new Man. Such exhibits acted as showcases for several ideas and justified the importance of children's art involving, in the Brazilian context, from governmental agencies to national newspapers and private companies. Aiming at inculcating an educational conduct based on assumptions such as the unrestricted freedom of children's creative spirit they had, as a contradiction, the censorship of themes considered unsuitable such as violence, and the need to follow a pre-defined esthetic standard.

Keywords: art teaching, history of art education, children's art, children's exhibitions, free expression

1. Introduction

The recognition of the specificities of the infantile condition by the fields of pedagogy and psychology, due to the advance of modernity throughout the nineteenth century, had as a consequence the renewal of the concepts of art and education in the period.

The need for change in educational systems, and the questioning of the adult view of the child, were all a concern of authors like the swedish educator Ellen Key, who published the work *The Children's Century*, in 1900. With a radically liberal orientation, Key stated that the school destroyed the pre-existing matter in the child, putting at risk the formation of his individuality [1]. On the other hand, from the first decades of the twentieth century, artistic avant-garde began to value, alongside primitive art, children's art as an example of artistic expression not yet contaminated by social conventions and academic prejudices [2].

The teaching of drawing as a preparation for labor in the industry, defended by currents linked to positivism and liberalism, had been questioned since the second half of the 19th century. Educators like the Englishman Ebenezer Cook, assisted by the psychologist James Sully, defended the importance of the imagination in the practice of drawing, in opposition to the hegemonic conception that saw in the discipline only as means of manual instruction and training of the eye and hand. In the work *Studies in Childhood*, Sully elaborated a theoretical explanation for the relationship between the infantile mind and its artistic production. Likewise, Thomas Ablett, founder of the Drawing Society (1888), defended drawing for its intrinsic values, and the act of drawing without proper pragmatic ends. For Ablett, the child should not be seen as part of an industrial gear, but as an individual capable of contributing more globally and effectively to society. He found desirable the development of the imagination, as well as the freedom in the choice of the themes and the expressiveness in children's drawings [3].

It is consensual among authors and researchers in children's art that the first experience of observing children who drew freely without any technical guidance was documented by Cizek in the 1880s. His conclusions would have generated the concept of self-expression and the teacher's interpretation as a spectator of the child's work, a guardian of his creative freedom. In his art school for children, created in 1897, the educator would have been the first to attribute pedagogical value to spontaneous child rearing. Cizek concluded that the child, under certain conditions, would be able to express himself in a personal and creative way, and that the artistic teaching methods previously adopted in the traditional school prevented the exercise of spontaneity and naive sensitivity. He also stated that the teacher should be a sensitive advisor, capable of guiding individual expression and innate creativity in the child. The rejection of the educational methods hitherto employed demonstrates the repudiation of the teacher as the center of the educational process, and demands a privileged and central place for the child within the school [4].

After the First World War, during the 1920s, the valorization of esthetic education was consolidated among European educators who saw art as an instrument of humanization and formation of a society free from violence and barbarism [5]. The proposition of art as an instrument for the construction of a new civilization had its best definition in the actions of Soviet constructivist artists and the Bauhaus school. According to Gooding [6], constructivism was based on the idea that after the catastrophe of recent wars and revolutions, art could play a relevant role in the construction of a new culture and civilization. Intending to functionally integrate art and society, artists such as Kandinsky, Tatlin, Malevitch, Rodtchenko, Gabo, and Pevsner, intended to functionally integrate art and society, aiming at the education of the masses and the aestheticization of the social environment. Assuming an almost messianic character, "they brought the new plastic order appropriate to the new social harmony. They spoke for the new world, for the new man" ([7] p. 16).

Bauhaus, an outpost for the penetration of these ideologies into society, was the most effective constructivist practical experience of education for the new world, working in the areas of architecture, landscaping, urbanism, advertising, furniture, and utensil design. In the Bauhaus manifesto, Gropius (1883–1969) hoped to prepare the ground for a "new structure for the future", planning and building for a "new man". He thus intended to end the distinction between artist and craftsman, and believed that his students would follow up on his ideal of society [8].

Bauhaus teachers spoke out against traditional teaching practiced in schools, believing that the transformation of society would be conditioned to the renewal

of the methods used until then. Among them, Hungarian László Moholy-Nagy criticized, in 1939, educational methods aimed at specializing in certain areas, noting that "a human being is developed only by the crystallization of the sum total of his experiences" ([9] p. 344). The artist was based on the view of the child as a being that brought with him a spontaneous and creative energy. He believed that education should contribute to the formation of the "integral man", emotionally and intellectually balanced, and capable of placing his individuality at the service of the community. The educators' task would be to coordinate the development of "human powers" and, for that, to found the grounds of a balanced life already in the elementary school.

The stimulus to creativity was in the ideological foundations of the Bauhaus, which intended to reconstruct the unity of the artistic and cultural sphere destroyed by industrialization, using art as an instrument of cultural and social regeneration [10]. According to its members, the school should forget the transmission of information and start generating knowledge itself, making it clear that creation was the fundamental expression for artists engaged in the educational process. This argument would be fundamental for those who worked with the teaching of art in the following decades.

Renewable educational experiences, put into practice in countries like England, Russia and Germany, were hampered by the progression of totalitarian regimes and the advent of World War II, and in many cases were interrupted. Nevertheless, Bauhaus' ideals of creating a better world would motivate Friedl Dicker-Brandeis (1898–1944), a former student of the Institution, to put them into practice in an extremely adverse situation. In the ghetto and concentration camp created by the Nazis in Terezin, the Czech city, children worked under their guidance [11], producing "pictorial narratives" that covered "past and future, hope and memory" in drawings showing "the barracks of the countryside, but there are also the seabed, the village bakery, the butterflies in the countryside, the bourgeois living room, the biblical landscape, clouds and stars over the reddish sky" [12]. Before being sent to Auschwitz with her students, where everyone would be executed, the artist hid thousands of drawings in two suitcases which, found later, had their contents revealed through the book *I Never Saw Another Butterfly*, by Hana Volavkova, published in 1964.

After World War II, the need to question educational processes is resumed, considering that a school isolated and independent of political systems would now not be enough to maintain peace. With the end of the war, the United Nations were created in October 1945 to replace the Society of Nations, and in November 1945, education ministers from the allied countries met in London with the aim of creating the United Nations for Education, Science and Culture (UNESCO). When officialized a year later, it had 20 member states and brought into its constitution the confidence that the promotion of democratic principles of dignity, equality, and mutual respect between men would prevent another war of world proportions [13].

The UNESCO proposal added faith in education as a promoter of peace and the encouragement of regional artistic production as part of the ideal of respect for the differences of men in their cultures, revealing their creativity and spiritual experience. The understanding and acceptance of differences were considered of fundamental importance to avoid a new war, and the artistic manifestation, in its various forms, appeared in the discourse of the creators of UNESCO as an instrument to promote spiritual satisfaction and disseminate the culture of peoples.

Education, for the newly created UNESCO, was conceived as an antidote to racism and nationalism, present at the origin of the second world conflict, and had a

broad sense of promoting understanding through the mutual acceptance of cultural differences. The Organization's plan for world peace included not only activities in the area of education, but of science and culture. Art, even though at first with a poorly defined role, was cited not only in its erudite form, being understood from the perspective of cultural identification that also included popular art, which opened the way for the valorization of children's drawing and other forms of popular demonstrations. Children's graphics, produced without any restrictions, started to be interpreted at that moment as a revealing manifestation of the child's individuality and an authentic testimony of his regional culture. Through these images, it was believed that it was possible to stimulate the exchange between different cultures without the intermediation of written language.

Edwin Ziegfeld, a professor at Columbia University, USA, linked to UNESCO, argued that contact with art would be able to instrumentalize children to deal with the problems of the 20th century, contributing to them becoming emotionally mature adults. Creative activities would have as basic characteristics individuality and integration, essential qualities to live in a world with permanent tension caused by conflicts and the Cold War, and where mechanization and technological advancement prevent the full development of the self. Through that, the individual would be able to see his relations with the world more clearly: "Art knows no national or racial boundaries. Children who are educated in close contact with the artistic forms of other countries are less inclined to create barriers against cultural exchange when they grow up. The United Nations are doing their best to encourage this spirit of mutual art education. International competitions and exhibition exchanges are two of the most popular methods employed" [14].

The decade following the end of World War II demonstrated that even after the repetition of great conflict, the ideal of the decisive role of art as a civilizing and social transforming instrument would still remain alive among artists, intellectuals, and educators. The child, a symbol of a state of purity, would be the raw material for the construction of a world without wars, a new beginning after the failure of the adult world. For that, it should be heard and protected so that it could develop in a balanced way. Expressions previously used, such as "children's drawing", "children's graphic language", or "children's graphics", fell out of use, and, from the 1940s, children's creations with drawing, painting, and modeling started to receive the common designation of child art.

Resulting from the ideas of intellectuals, educators, and artists, the exhibitions were seen as essential strategies for the consolidation of children's art, as a manifestation endowed with esthetic attributes and for the institution of its educational value. For them, the spectators' confrontation with the children's drawings and paintings was the best way to disseminate the ideas that credited art with a transforming power of individuals, capable of contributing to the formation of a better human being. The strong impression these images made on specialists and on the general public was more effective than the verbal defense or the presentation of projects, theoretical texts, or reports of experiences.

2. The first children's art exhibitions

Art teaching experiences are often characterized by an exhibition at the end of work, a moment of pleasure and fulfillment for the participants and advertising to the teacher, to their school, and to the methodology adopted. In general, the practice of

exposing child artworks as evidence of educational methods has as one of its origins the great universal exhibitions held since the middle of the 19th century. Initially designed to show the progress of modernization and the products of the industry, they were organized based on didactic, normative and civilizing intentions, and achieved great repercussions in their time. First carried out by countries such as England, France, and the United States, they were soon imitated by others like Brazil, giving prestige to education as a sign of modernity, and spreading proposals in this area, which included didactic materials, pedagogical methods, and different levels of teaching [15].

The first major international exhibition took place in the city of London in 1851, followed by others in several European and American cities. Spectacular shows on the triumph of capitalism, such exhibitions were organized by representations of the participating countries, resulting in a comparative process between the most and the least developed. Subjected to a detailed categorization, the exposed objects were evaluated by a judging committee and competed for awards.

Brazil, in addition to being represented at international exhibitions, also endeavored to organize national events, demonstrating the desire to present the country as civilized. This effort resulted in a series of publications, such as catalogs, regulations, magazines, books about the country, albums, commemorative editions, and reports, also yielding articles in newspapers and magazines of the time. In the sections dealing with education, students' work was displayed alongside administrative documents, school buildings and furniture, teaching materials and lesson plans for teachers.

Deriving from the experience of universal exhibitions, specific events focused on educational issues started to be organized. The First Pedagogical Exhibition, held in Rio de Janeiro in 1883, is a good example of this type of initiative, revealing the interest of intellectuals and educators in the renewal of teaching. In addition to national institutions, European and American exhibitors were invited to submit proposals for each level of education. The invitation to the exhibition listed the objects that could be shown, which also included the students' production, together with the explanation of the adopted methods [16].

The model of holding exhibitions as evidence of the modern teaching methods migrated to the interior of schools, spreading especially between the last decades of the nineteenth century and the first decades of the twentieth century. Rosa Fátima de Souza [16], when analyzing the implementation of graduated school in the state of São Paulo, emphasized the importance of school exhibitions, alongside the exams and closing parties of the school year. These events, a source of pride for teachers, students and families, had the function of making public the activities developed in educational institutions, representing an opportunity for not only the family, but also for the general population, to become aware of the quality of work done there by teachers and students, as well as their care, skill, effort, commitment, and dedication. For the author, school exhibitions explain the multiple ways in which the primary school built its institutional identity and extended its pedagogy to the wider society. Nevertheless, the adoption of parameters of excellence based on the idea of care generated distortions, as all schools wanted to show the best, even if they were not able to do so. In many cases, they simply opted not to do such shows, for fear of the principal and teachers of presenting poorly done works. In others, the exhibitions were nothing more than staging, presenting works by teachers or parents as being done by students.

The rigidity of the parameters for the judgment of child production and the suspicion that they were not always the authors of the works were grounds for criticism by educators identified with the renewing movements for education in the first decades

of the 20th century. For them, the exhibition of child artistic works should serve to show not the excellence of execution, but the spontaneity of children's expression and their development process. Using the same strategy as their predecessors, these educators sought, with the exhibitions, to publicize very different ideas. In the case of children's art, more than exposing the technical skill or precociousness of the participants, the exhibitions became the very discourse of sustaining a concept: the child had a natural propensity to manifest themself through the arts and this practice should be encouraged, as it would bring benefits to their psychological and social development.

It is said that, after Franz Cizek's experiments at the end of the 19th century, the German educator Georg Kerschensteiner would have organized an exhibition of children's drawings in 1902, being the first international exhibition of children's art held in France in 1922 [17].

On one hand, school exhibitions are rooted in the idea of bringing progress and civilization to the public, and on the other, exhibitions of children's drawings with a modern orientation can also be related to the expositional traditions of the art field, in view of the transit of information among educators, pedagogues, psychologists, and artists. It was the visit to such an exhibition that motivated the English educator Marion Richardson to continue investing in the direction of teaching of art with a renewing tendency, which would become exemplary. Organized by the art critic Roger Fry, the Exhibition of Children's Drawings, which took place in 1917 at Omega Workshops, featured drawings made by kids, children of artists. The event impressed the educator, triggering the consequent exchange of ideas and experiences between the two professionals. Fry did not agree with art teaching methods in the school context, as they did not respect child spontaneity in the different stages of child development. From then on, Richardson started to use the exhibitions as a strategy for the dissemination of her teaching methods [18].

Cizek also used the resources of exhibitions to disseminate his methods, such as those held in Cologne (1914) and Munich (1920), in Montreux (1923), in the Netherlands (1920 and 1924), and in Vienna (1929). There is also the registration of an exhibition, which would have traveled through Great Britain (1921 and 1924), as well as a participation in the Exhibition of Applied Arts in Paris (1925). Similar exhibitions also circulated in North America (1924–1929) and South Africa (1934) [4].

In England, Barclay-Russel, an educator who had served as a missionary in Africa, started in 1936 a project that focused on artistic production for children and teenagers, giving rise to a collection of thousands of examples of drawings and paintings made by them. He was the founder of the New Society of Teachers in Art, which was transformed in 1940 into the Society for Education in Art. In association with Richardson, he organized in 1938 a large children's art show at County Hall, in London. His intention to found a Research Center designed to prove "the indispensable value in a healthy society of genuine creativity encouraged in childhood" ended up not being realized due to the war situation in which Europe found itself ([3] p. 45).

However, an exhibition held in the 1940s was perhaps the most fruitful among European, North American, and Brazilian educators and artists. An invitation by the British Council to Herbert Read during World War II sparked his interest in children's art. The proposal was to bring together British works of art that would go on a traveling show through neutral countries, but as transporting them across the Atlantic would be a risk in time of war, they opted for a show of art by children from several British schools [19]. This project created the bridge between Read and the work of Barclay-Russel, who saw the thinker as his ideal advocate. These works had been

carried out after the English educational reforms, which intended to renew concepts based on applied psychology. The presentation text, written by Herbert Read, pointed out some factors as of relevance for the recognition of children's art as an esthetic experience: the appreciation of primitive art and the revolutionary development of modern art, as well as the performance, in England, of educators dedicated to the defense of the insertion of art in the school curriculum. He was also keen to point out that, although produced during the most intense period of Nazi bombing, very few drawings had war as their theme.

Starting in England, the British Council Exhibition of British Childrens's Drawings circulated in countries such as the United States, Canada, Brazil, and Australia. A few years later, this same exhibition would travel the world, arousing the interest not only of educators, but also of the European artistic milieu. The director of Château d'Antibes, an institution on the south coast of France, recalls that he received the exhibition organized by the British Council in 1945, which was visited by Pablo Picasso [20].

The contact with the artistic works of those children made Read dedicate himself, in the following years, to the study of children's creativity, producing works that became essential for educators in various parts of the world, such as *Education through art* (1943), *The education of free men* (1944) and *Culture and education in a world order* (1948), among various others. Read believed that greater understanding and peaceful coexistence between peoples would have its roots in the integral development of personality through education, and so the art of the child would be the guideline of this philosophy: the heroic task of education would be to prevent the child from losing contact with his roots and cultural values by manifesting himself symbolically [20].

The developments of this exhibition on Brazilian lands will be discussed next.

3. Children's art exhibitions in Brazil: showcases of a new way of seeing art education

The actions relating to art education in Brazil, aimed at children, date back to the first decades of the 20th century. Historiography points to experiences carried out by modern artists and intellectuals such as Anita Malfatti and Mário de Andrade who, in the 1920s, developed educational projects aimed at the child's artistic expression. The appreciation of the role of art was also present in the educational scene linked to the New School Movement, especially in the reforms undertaken in some Brazilian states based on the dialog with the ideas of John Dewey [21]. Although sporadic, some children's art exhibitions had already been held since this period, like the exhibition of Japanese children held in 1928 in Rio de Janeiro. In 1933, an exhibition was held in São Paulo at the Club of Modern Artists – CAM, within the Mentally ill and children's week [22].

The English children's exhibition, organized in 1941 by the British Council, is considered a milestone in the Brazilian cultural and educational scene and a motivating factor for projects subsequently undertaken in other regions of Brazil. The exhibition opened in Rio de Janeiro in October 1941 at the National Museum of Fine Arts, having subsequently circulated through the states of São Paulo, Minas Gerais, and Paraná. The event was hailed by the press and educators "as a demonstration of confidence in the future from a war-torn country" [23]. Intellectuals, journalists, artists, and teachers visited the show, being impressed by the quality and expressiveness of the works. Brazilian artist Augusto Rodrigues was one of these visitors, along with a group of

artists and educators who were already meeting to discuss the relationship between art and education. The appreciation of the exhibition aroused in many professionals the certainty that Brazilian children, if stimulated, would also be able to produce works of comparable quality.

In the exhibition catalog, Read presents his ideas for the first time in Brazil, according to which the child would be endowed with an innate creative potential and ancestral purity, not needing any interference from the adult world to manifest the "universal characteristics of the human soul, not yet spoiled by social conventions and academic prejudices" [24]. Perhaps more surprising to those who witnessed the 1941 exhibition was his claim that the current teaching prevented the development of children's personality. The objective of these new methods would be to achieve "the child's pleasure", allowing the activity to become "instinctive", requiring a new attitude from the teacher, which would become an incentive for the artistic potential to be explored by the child, creating an atmosphere that would induce her to "externalize the rich and lively fantasy that is in her mind" [24].

The creation of an "atmosphere", suggested by the Read method, seems to have been relevant in the following experiences developed in Brazil, which started from the assumption that the traditional school environment was not the most suitable for the development of creative activity. It was not just the teacher's attitude that should change: it was necessary to change the physical space itself. Tables, chairs, introducing new functions, and instruments, and creating an identification in no way close to the old school. The adequacy of the classroom space to the child's dimensions was already found in the proposal of the Italian educator Maria Montessori. However, the practice of drawing she adopted was limited to an exercise of muscular coordination in preparation for writing. Its application was restricted to geometric figures filled with colored pencils in a predetermined way Montessori believed that her method would result in greater coordination of movements, which would be essential for the production of "harmonious" drawings [25].

For Read, the main objective of the British Council was to provide proof of the "vitality and hope" that the British had not abandoned even in the face of the misfortune of war: "The children who made these drawings and paintings will be adults in a post-war world. And we believe that the sense of beauty and the attitude of love for life, expressed in the childhood of these men of the future, will flourish in a world that is forever free from tyranny and odious wars of conquest" [24].

In the project of Herbert Read, ex-combatant of World War I and now a staunch pacifist, children, "men of the future", would have a fundamental role in the maintenance of peace in the post-war period, with the renewal of the school and its methods the main way to achieve this goal, and creativity the main factor for the free personality of these men. To the disbelief in the capacity of the old methods was added the belief in the infantile capacity to create without the need for models of the adult world. The teacher's behavior would thus be fundamental for the child to develop in freedom. Dissatisfaction with the methods adopted until then by the "common school" would be a repeated argument among those responsible for the art schools put into practice in Brazil.

This exhibition may have contributed decisively to the emergence of experiences of art schools for Brazilian children and of children's art exhibitions, serving as a model. The most well-known and influential of these experiences, later named *Escolinha de Arte do Brasil* – EAB (Little Art School of Brazil), began its activities in 1947, in Rio de Janeiro, at the initiative of Augusto Rodrigues and the American painter Margareth Spencer, and would become a reference for similar institutions that

emerged later in the country. According to Rodrigues himself, the name chosen for the institution was used at the beginning by the children who attended the meetings to differentiate this environment from that of the regular school, being definitely adopted when the need for a name was felt: "one was the school where They were going to learn, the other where They were going to experience, expand, project themselves" ([26] p. 39).

Rodrigues' testimonies highlight the importance of the English exhibition in the idealization of the project of his art school. It is also present in the declarations of that period the certainty that the school did not offer the adequate space for the artistic expression of the child, nor was it prepared to understand the importance of art for childhood.

In 1948, another event reinforced the initiatives of Brazilian artists and educators committed to a new interpretation of children's art. Drawings by Brazilian children had been sent to Italy to participate in the International Exhibition of Children's Art promoted by the Pedagogical Center of Milan. However, the Brazilian representation was refused in full by the organizing committee, which claimed not to have found a free, spontaneous, and natural view there. They also claimed to be "evident that in each of them there was the finger of the adult, parent or teacher, looking for the 'copy drawing', the 'well done' drawing, the demonstration of precocity, the stereotyped 'good taste' ([23] for. 31). In this type of event, the teacher's participation was reconsidered, rejecting erudite artistic training or traditional and technical knowledge of plastic language, in exchange for the preservation of an idealized vision of the child's graphic manifestation, seen as possessing qualities that should be encouraged.

The impact of the refusal of Brazilian representation favored the establishment of the recently created Escolinha de Arte by Augusto Rodrigues in Rio de Janeiro and also the appearance of other initiatives to promote children's art in the following years.

The circulation of children's works for exhibitions, started in Brazil by Herbert Read, has become a current practice, involving institutions in Brazil and abroad. Through the images produced by children from all corners of the world, the idea that artistic expression is inherent to the individual took strength, constituting evidence, on the visual plane, of the ideals defended by modern educators interested in art.

According to Rodrigues ([26] p. 87), the exhibitions represented a landmark of unity that connected the experiences of art education in the world. This showcase of modern ideas for art in children's life gave credibility to the projects carried out, making the art schools respected. The exchange took place in two ways: Brazilian institutions received exhibitions from abroad and, in turn, received invitations to participate in this type of event abroad.

Following the example of the English children's art exhibition, *Escolinha de Arte do Brasil* invested, since its foundation, in this kind of exchange. In 1950, Rodrigues received an exhibition of works by Argentine children who participated in the *Children's Painters Clubs*, entities attended by about 700 young people and directed by Esteban Ocaña. The Institution also organized exhibitions of Brazilian children in Mexico, Great Britain, Japan, France, Chile, Italy, Argentina, Netherlands, Spain, Czechoslovakia, Paraguay, China Korea, Austria, Venezuela, Philippines, India, Yugoslavia, Germany, and El Salvador. These events were accompanied with explanatory leaflets on the Brazilian experience, on the bases of the work developed and on the methods of selecting the works [23]. In 1953, the III National Exhibition of Children's Art, organized by Augusto Rodrigues and promoted by the Ministry of Education and Culture, brought together 1,500 works by children from all over Brazil [27].

Children's exhibitions have multiplied since the end of the 1950s, giving visibility to promoting institutions and government agencies, which justified them by the benefits that children's artistic expression could bring to the child's education. On June 21st, 1961, *Folha de São Paulo* announced the opening of its 1st Children's Art Salon. According to the article, this initiative sought to "encompass the artistic expression of children in all fields, through their creative spontaneity, in addition to providing the São Paulo child with more appropriate means of transmitting their natural inclinations and instilling a sense of responsibility more clearly in the collective consciousness, making it turn with more accuracy to the problem of child orientation" [28]. The exhibitions of child art productions made this child and their needs visible, now seen as a problem for the community that needs to be awakened to find solutions.

According to the newspaper, 1,300,000 children enrolled in the project, a success that was due to the efforts of the state government – which, "in order to face the child phenomenon more rationally and humanely", understood "the educational strength of the Salon" –, the Regional Teaching Precincts, whose enthusiastic principals and teachers "enlivened" the young artists, and the Head of Primary Education, coordinator of regional works. This articulated work made the *Folha de São Paulo* initiative, associated with the Year of the Child, expand its action, with the participation of children from all over the state.

The Salon, which distributed prizes to the children selected by the jury, was not limited to drawing and painting, but also included modalities such as guitar, harmonica, poetry, and declamation, among others. Among the winners were boys and girls between eight and eleven years of age, a range considered most suitable for truly creative artistic manifestations [28].

The jury, composed of art critics from Rio de Janeiro and São Paulo, directors of art galleries, visual artists, writers and jurors of the VI São Paulo Biennial, had the objective of not rewarding works, but "analyzing what, for his bad esthetic taste would have been perhaps more of an adult responsibility than a childly one" [28]. In their statements, the judges often contradicted themselves, minimizing the fact that the event had a clear objective of rewarding the best works, even if according to a specific view on children's art that favored a "free" demonstration. Seeking to minimize the weight of the classification and award criteria, its members recommended that, for the next events, children should ignore the fact they were drawing or painting for a competition, which would avoid "psychological, moral, and pedagogical losses" [28].

The receptivity and popularity of this type of exhibition seems to have been quite large. Four months after the São Paulo Children's Art Salon, held from October 23 to 31, 1961, the 1st Carioca Children's Art Salon took place in Rio de Janeiro, sponsored by the newspaper *Jornal do Brasil* [29].

However, already in January 1962, *Folha de São Paulo* would announce the promotion of a new salon now nationwide, the I National Salon of Children's Art. However, already in January 1962, *Folha de São Paulo* would announce the promotion of a new salon now nationwide, the I National Salon of Children's Art. The event had great repercussions, being supported by newspapers in various states. The works in the area of fine arts for the competition should be carried out during class hours. The theme should be free, of the student's own inspiration, without any guidance from the teacher, excluding political and administrative themes, graphic crests, maps, and caricatures alluding to historical characters or facts. The works should have dimensions of 30 cm x 40 cm. Drawings should be done in pencil or pen and paintings with a brush and paints. In modeling, the work should be done in ceramic, stone or wood.

The regulation also provided for a trial according to the following categories: from four to six years, from seven to eight years, and from nine to twelve years of age [30].

At the award ceremonies in the various cities where the event took place, an excerpt written by Augusto Rodrigues was read: "Each child brings in themself his world of art and creation. In children we are all spontaneous artists, but later, squeezed by the rules and disciplines invented by those who lost their childhood, we are living, shopkeepers and bankers, captains of industry and carpenters, boring, big people, anyway. This compression is what makes us lose the courage to like a vague color, to feel a risk and a shape, which apparently do not mean anything. Escolinha de Arte tries to give children the courage of that love permanently" [31].

The reference to the child's spontaneity and the limits that prevent the development of sensitivity sounds contradictory in an event that establishes so many rules and that subjects the children's work to a selection process and to awards awarded by a jury according to esthetic criteria. This contradiction demonstrates that the idea of children's art as a free expression and above comparisons with classical art coexisted with exhibition practices that rewarded and ranked in a certain order of excellence. Perhaps it demonstrated that the now popular children's art would be subject to interpretations produced not only by educators, but also by other agents guided by different interests: newspapers, companies, and the parents themselves, hoping to see their children recognized as "child painters".

However, there was not always complete agreement between the organization of these events and the institutions invited to participate, regarding the type of work to be sent within the great framework of free expression, or spontaneous expression. In 1959, the artist and professor Guido Viaro, director of the *Centro Juvenil de Artes Plásticas*, a Paraná institution created in 1953, publicly criticized the guidance of the Department of Extra-curricular Education in Guanabara, which had asked the Paraná Department of Education and Culture to send from drawings and paintings made by children from primary schools in Paraná to participate in an exhibition of spontaneous painting, recommending that the themes be preferably regional. Viaro argued that the proposal was contradictory, since child production does not recognize regionalist barriers [32]. Nevertheless, Paraná, through the Youth Center for Plastic Arts and School Groups, participated in the aforementioned exhibition, having works selected for participation in an international exhibition, in which Brazil ranked first.

Other states in the country have also undertaken similar initiatives at the regional level, some involving exchanges with other states or countries. The Youth Center for Plastic Arts had fifty works by its students sent to be exhibited in Chicago in 1955, also during the same period, exchanging with cities such as Belo Horizonte, Fortaleza, Recife, and Porto Alegre. In 1958, the Rio Grande do Sul Museum of Art, in a similar initiative, received an exhibition of German children's art [33–34].

The Dutch Children's Drawing and Painting Exhibition, held in Curitiba in 1959, was sponsored by the Ministry of Education and Culture in collaboration with the Embassy of the Netherlands. Considering that the presence of art in school is an enriching factor for the individual, the presentation text of the exhibition emphasizes the importance of the "esthetic formation of the child" and the "creative act in the development of the human being". Then, remember that the act of creating is more important than the work done, as it will be the one that will bring the greatest benefits to the child's development. Since the need for expression "is inherent in every individual", what can be seen in the exhibition is "expression in its pure form, which comes to the surface through stimuli and methods in which respect for children's personality is always present." [35]. The child, immersed in an "atmosphere of freedom", would have

the possibility to "normally" overcome the successive stages of his development, which would free the teacher from the "tension" characteristic of academic art education: "But if, on the one hand, the teacher frees themself from coercive norms, they are left with a more subtle and complex task – they are led to the effort of observing the child more deeply and of being able to discover and fully develop the innate capacity. of each of his disciples. Evidently, this type of education does not aim at the well-endowed supposed nor does it intend to train artists, but, above all, it seeks to teach the values and disciplines essential to the full intellectual, affective and social development of the individual, within the community" [35].

The author of the text states that what is presented is "expression in pure form" and that a new teacher will be needed, specially qualified to deal with this delicate expression so as not to harm it. For him, the production, by the child, of a drawing or a painting, would be the result of an innate ability, the result of his own condition as a child, even though there were the "gifted" who would do without any help, not needing this type of assistance, educator, not specialized in forming artists, but dedicated to structuring those children emotionally and socially. There is, apparently, a contradiction when it is considered that the "gifted" do not need this education, since it is not intended to form artists, even they could need these values that are intended to be taught. On the other hand, if there is no need for academic education, there is a need for new techniques, which would justify the qualification of a new specialist.

Concerns about the formation of the child's personality and the role of art as an aid to education, were not the only motivations for children's art exhibitions in that period. Gradually, they would assume a role of reconciliation and rapprochement between children from different cultures stimulated by the post-World War II atmosphere marked by the so-called "Cold War" and the atomic threat. Often supported by UNESCO, which defended the role of art as a trainer of an "integral man" [36] – one who, together with knowledge, would develop sensitivity and emotion – these exhibitions, which toured the world bringing together children's drawings and paintings of diverse origins, propagated the stimulus to the understanding and the tolerance to the differences as a way to guarantee the reconstruction of a peaceful world.

One of these exhibitions, entitled Art for World Friendship, arrived in Curitiba in 1961, promoted by the international organization Art for World Friendship, based in Pennsylvania, USA. Born in 1947 in the city of Philadelphia, this organization aimed to establish personal contacts, through painting and drawing, between children of different cultures, beliefs, ideologies, and countries, believing that "through their art and without the language barrier they they could learn about each other's lives and interests; to create a bond of understanding and friendship between them until they reach adolescence and adulthood" [37]. Children's drawings were considered direct means of communication, as they did not require the interpretation of adults, constituting "colorful messages of friendship and goodwill that walk, firm and bold, from country to country, from community to community, from school to school, from child to child" [38].

The works were first selected according to the author's age and geographical origin, and after being exhibited, they were redistributed to children from other parts of the world. Each child who sent their own composition would receive another one, made by someone of their own age, from another country. The drawings should be spontaneous, covering any theme, with the exception of war matters, which were strictly prohibited. Even considering the fact that censorship of children's testimonies about the atrocities committed by man was intended to provide the viewer with a message of peace and optimism, this restriction put in check the much-acclaimed

freedom of expression for children, limiting their spontaneity to the exploration of positive themes. Thus, a type of demonstration that could have the power of the complaint was silent, for fear that it might contribute to the generation of more violence.

This first exhibition presented, in addition to the drawings of the children of Curitiba, others from Art for the World Friendship of Pennsylvania and seven other countries, in a total of 125 works [37]. The Curitiba press, emphasizing the great interest aroused by the exhibition, drew attention to the similarity between the drawings of Brazilian children with those made by children from distant countries, noting the "artistic development achieved by our 'Escolinhas de Arte' in comparison with the other nations" [39]. The newspaper published photographs of a work done by a Thai child and another by a child at the Escolinha de Arte at Colégio Estadual do Paraná, a state school based on the city. The drawings reproduced in no way resembled children's doodles. The Thai child or teenager reproduced an oriental religious image with a very developed work of light and shadow, which can be the result of both copying from photography and direct observation. In turn, the Brazilian child presented a clown head with a sad expression that, despite not showing a technique as developed as that of Thai work, demonstrated the knowledge of representation schemes acquired through the observation, most likely, of the work performed by other artists. The Soroptimist exhibition was certainly not concerned with the presence of works that demonstrated the traditional study of drawing and even copying in some cases, since the exhibition was primarily aimed at promoting exchanges that, it was believed, would contribute to peace between the peoples.

A year later, the second Art for World Friendship exhibition was held in Curitiba, now presenting around a thousand drawings from 42 countries and eight Brazilian states from various formal and informal educational institutions.

The catalog of the Second Art Exhibition for World Friendship [38] showed a much greater involvement of institutions from Paraná and others from outside the state, accusing the participation of children from the Little Art School of Brazil, other institutions of Pernambuco, Espírito Santo, Santa Catarina, Minas Gerais, São Paulo, Rio de Janeiro, Rio Grande do Sul, and Paraná. In addition, children from Central and South America, Africa, Asia, Oceania, North America, and several countries in Europe also participated. From the countries of the socialist bloc, only representatives of Czechoslovakia and Poland were present. The exhibition catalog recorded the techniques used in the preparation of the works, which were quite diverse. In addition to the traditional tempera, charcoal, wax crayons and pen nibs, finger paintings, collages with recycled paper from magazines and newspapers, prints made with cork stamps and mosaics were presented. Compositions made with experimental materials such as twigs and strings were also shown. The exhibition had no competitive character and, therefore, would not distribute medals or prizes. The catalog featured a "conclusion" page, where the president of the Brazilian Art Commission for World Friendship declared that the organization's only objective was "strengthening children's and youth's generosity", and that through children's art it would be possible "to supply the basic needs of man, since it reflects the soul and feelings of the citizens to come". Announcing that the exhibition's works would be sent to other countries, the president believed that it would be possible to promote understanding and tolerance since: "With the unfolding art of the Brazilian girl's soul, united to the hearts of children from the ends of the earth, who knows, maybe a better world can be built, or modified, for the future. Let us raise our thoughts to God and have faith, therefore, in the idea that the exchange of drawings will turn into a pleasant, effective and lasting relationship" [38].

Art for World Friendship's statements emphasized that the works displayed did not demonstrate academic knowledge, but rather an art: "[…] spontaneous, alive, social, tender and human, of children, for children and between children, without distinction of color, race, political or religious ideology. It is only intended that the little authors recognize each other as siblings and as friends, and that their art represents the most vibrant attempt for a dialog of peace and harmony with all the peoples of the Earth" [38]. For the organization, children and young people were considered the fundamental step to modify and rebuild the world.

Children's art exhibitions continued to be organized throughout the 1960s, always with the spontaneity and spontaneity of their participants as the main keynote. In 1963, the 3rd Art Exhibition for World Friendship took place in Curitiba [40]. In 1966, the Infantil Art Salon was held at the Art Museum of the Federal University of Ceará. In the folder accompanying the event, Jean-Pierre Chabloz [41] stated that the 64 works on display, written by public and private schools, were "entirely free and spontaneous". The author stresses in his text the importance of children's expression through drawing, pointing out in children's production similarities with modern painters such as Van Gogh, Matisse, Pierre Bonnard, Vlaminck and Gauguin. For Chabloz, this kind of experience was only possible if children were released from the "infant-school prison" that was the traditional teaching environment.

4. Conclusions

The rhetoric of educators and pacifists after World War II reflects the fear of a nuclear catastrophe and builds a representation of the child as the main and only hope for a future without wars. This criterion, which intended the free artistic expression of children as a strategy for the formation of a new man, identifies traditional artistic knowledge as a representative of a world that would have failed in every way. The child's drawing, which is easy to transport, comes to be seen as an important instrument for mutual understanding and non-verbal communication between different countries.

Later, after the fear of imminent war was removed, the desire seems to have remained that, through art, the child exercised creativity and would become an adult capable of relating to the world in a more creative way. The speeches take different forms and their objective is progressively no longer based on the need for mutual understanding, but on the stimulation of creativity as a preparation for life in an increasingly technological and supposedly dehumanized society. The school, criticized and "guilty" for suffocating the child's soul, should reform its methods and practices in order to stimulate the student's creativity.

Beginning in the 1950s, initiatives to promote children's art through exhibitions became frequent in several Brazilian states, sometimes assuming a competitive and awarding character that contrasted sharply with the pacifist and libertarian intentions promoted by the ideals of UNESCO. It appears that the children's art exhibitions, in this period, gain an irresistible attraction to parents and teachers and the media, consolidating the child as an autonomous individual creator who, in addition to not needing any guidance from adults, seems to produce images worthy of the admiration of classical art, or the "art of adults".

It is possible to identify that a new criterion for the analysis and selection of these works arises from the point of view of plastic arts or the individual manifestation of the child. However, the edition of the 1st Children's Art Salon at *Folha de São Paulo*

had quite different objectives from those that guided the first Soroptimist Club exhibition that took place in the same year in Curitiba. The Curitiba exhibition was keen to make it clear that it had no intention of rewarding or even classifying children's work, prioritizing the integration between children of different nationalities according to the criteria of the organization Art for World Friendship. The jury of the 1st Children's Art Salon, as published by the São Paulo newspaper, tried to demonstrate the usefulness of artistic teaching and the need for pedagogical revision on a more advanced basis. There are no references in the article to humanitarian issues like those of soroptimists, but it is clear that old procedures had no place within the new bases considered by the jury. The objectives of these two initiatives demonstrate that several orientations based the professionals and institutions that promoted children's art in the early 1960s.

The production of these drawings reveals contradictions, since, despite the touted non-interference of adults, it was expected that they would not show any trace of what was considered to be basic knowledge of visual language or techniques associated with traditional teaching of fine arts, in the privilege of an approximate esthetic of the expressionist character figuration. On the other hand, it was preferable for the child to explore themes related to his daily life, his city or his village. These points apparently contradict the rhetoric of freedom of expression, as well as the teacher's role, since, if the child should create freely, should this "new" specialist act like a mere observer?
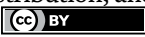
Children who participated in these salons belonged to primary schools or art education institutions. For this reason, they were accompanied by teachers when carrying out their artistic works, not always being able to put into practice the freedom of expression so dear to the defenders of the exercise of creative capacity.

Author details

Dulce Regina Baggio Osinski* and Ricardo Carneiro Antonio
Federal University of Paraná, Curitiba, Brazil

*Address all correspondence to: dulceosinski@gmail.com

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Chapter 19

Teachers' Beliefs about Poverty: A Barrier We Must Face

Viviana Gómez, María Paz González and Pablo Gutiérrez

Abstract

The poorest children have the lowest educational results, which the neoliberal model has deepened. The State transferred its responsibility to private and municipalities through supply subsidies, but the amount did not ensure quality. To solve this problem, it provides an additional subsidy for each "priority" child, demanding accountability, but with high institutional and individual consequences. But the gap remains, and teachers are held accountable for these low results. The literature shows that teachers hold beliefs that prevent them from dealing constructively with this reality. Beliefs about poverty were investigated by asking 828 teachers from low and lower-middle SES schools with standardized test scores above and below the average of similar schools to point out four characteristics of vulnerable schools. The data were analyzed by means of thematic and semantic field analysis. A shared narrative was found, independent of the type of school, attributing failure to the degraded context that surrounds it, from which the families and children come. Neoliberal policies based on accountability have intensified the work of the teacher and the constant threat has led them to self-defense. There is an urgent need to change the approach if opportunities for the poorest children are to be improved.

Keywords: beliefs, poverty, teachers, accountability, social justice

1. Introduction

In the last four decades in Chile, neoliberal policies have synchronized the educational system with the market economy [1]. This has implied, on the one hand, the introduction of new concepts and processes such as quality, efficiency, competition, and accountability [2] more typical of a business model than of an educational one [3]. On the other hand, it has led to profound changes in terms of financing, evaluation, and monitoring of these policies in schools. The main consequence was the disappearance of public education in 1982 and the mutation of the State towards a subsidiary role, delegating the responsibility for education to private or decentralized providers in exchange for a subsidy that functions as an incentive to supply and demand [2]. According to [4],

> *The state acts as a market-maker in this scenario, as it produces and organizes markets for public assets, such as education. It achieves this not only through a competitive*

> *funding system but also by creating policy tools that assign value to education provid-ers through differentiating market signs, such as scores, rankings, and quality ratings, which are then linked to rewards and sanctions. These market signs are crucial for producing school hierarchies, distinction, and comparison, granting school's symbolic reputation and, therefore, a sense of competition (p. 116).*

However, this arrangement did not ensure improvement in the supply of education, nor did it improve the quality of learning for the poorest. On the contrary, the system of single-value subsidies, as designed, benefited more those with greater sociocultural advantage [1].

1.1 An education policy of accountability based on results

Despite the attempts of the post-dictatorship democratic governments to strengthen state support to education, a series of public policies that deepened the neoliberal model followed, which were finally integrated into a single system aimed at granting funding to schools whose core is managerial accountability, which is strongly associated with results in large-scale evaluations instead of processes [5].

In 2008, the SEP Law [6] was enacted, aimed at improving educational equity for the most disadvantaged groups, providing additional resources to subsidized schools according to the concentration of "priority students". This subsidy was provided after the school had signed an Equal Opportunity and Educational Excellence Agreement with the Ministry of Education and submitted a School Improvement Project (SIP) in which the school committed itself to achieve important advances in terms of curriculum, school management, school coexistence, and human resources management [6, 7].

More recently, new public institutions were created to closely regulate the best implementation of these public policies, the Agency for the Quality of Education (ACE) and the Superintendence of Education. This was intended to ensure access to quality education and equity for all [8]. The ACE is in charge of the national evaluation process and, according to its results, annually classifies schools according to the performance of 4th-grade students in the test of the Sistema Nacional de Evaluación de resultados de aprendizaje del Ministerio de Educación de Chile (SIMCE) and other complementary indicators, but with a much lower weight. In this way, schools are classified as "autonomous", "emerging" or "recovering" according to the criteria shown in **Table 1**. These demands have placed a high pressure on schools, in which eight to nine standardized tests (approximately four levels and four subjects) are applied annually [9].

The "emerging" category is applied when schools show intermediate results, which are qualified as medium or medium-low; when schools have only two SIMCE evaluations or when they are new establishments, or their student body is less than 20.

1.2 Accountability with high consequences

The classification obtained by schools has a direct impact on the funding they receive from the state. High-performing schools are classified as autonomous, receiving double the subsidy per priority child compared to schools classified as emergent. At the other extreme, "recovering" schools that show sustained low performance may have consequences such as the removal of the management team

Weighting	Criteria	"Autonomous" schools		"Recovering" schools	
70%	Achievement in the SIMCE Test	Average in SIMCE higher than the median obtained by similar schools		Average in SIMCE less than 220 points	
		Percentage of students with more than 250 is higher than the median of similar schools		Percentage of students with more than 250 is less than 20%	
		Percentage of students with more than 300 is higher than the median of similar schools			
30%	Administrative dependency	No municipal	Municipal	No municipal	Municipal
	Priority student retention rates	25%	25%	25%	25%
	Priority Student Pass Rates	25%	25%	25%	25%
	Integration of teachers and parents to the IEP	20%	17%	20%	17%
	Educational innovations and attraction of external support institutions	15%	13%	15%	13%
	Improvement in working conditions and operation of the establishment	15%	13%	15%	13%
	Participation of teachers in the national Teacher Evaluation System	—	7%	—	7%

Table 1.
Criteria and weighting for the classification of schools according to their achievements in the SIMCE test and in the other improvement indicators committed to in their IEP.

or be subject to definitive closure [4, 10]. These schools are monitored by the ACE through repeated inspection visits aimed at providing feedback on teaching and school management [11].

The basic principle of neoliberal ideology is that institutions do not feel that they have a secure and stable budget, because permanent quality improvement is achieved only through the promise of incentives, risks, and sanctions [4]. However, after more than a decade of its implementation, standardized assessments continue to report a great influence of socioeconomic level (hereafter SES) on learning, showing a large gap between low and high SES students [12, 13]. These results have led us to wonder about teacher subjectivity. Could there be a problem in the beliefs they hold about poverty?

1.3 The crucial role of beliefs

Beliefs are "individual judgments about the truth or falsity of a proposition, a judgment that can only be inferred from a collective understanding of what human beings say, intend, and do" [14] (p. 316). Moreover, because of their affective,

evaluative, and episodic nature, they become filters through which new phenomena are interpreted [15] and expectations are developed that influence the teacher's action [16].

Teachers are not immune to the influence of stereotypical beliefs [17], as these are acquired unconsciously from the experiences and habits of their social environment, which are put into practice on an ongoing basis [18]. A relationship has been found between stereotypical beliefs and low expectations in teachers, which has led to demand changes in the initial and continuous training of teachers to influence their beliefs so that they understand that poverty is a product of gaps in access to opportunities and not of deficiencies in mentality, culture or people [19].

1.4 Research question

What beliefs about poverty hold in-service teachers working in low and lower-middle SES schools with above or below average performance on the SIMCE test of schools of the same type?

2. Methodology

A qualitative design was applied that attempts to detect the importance and meaning of group discourse within a sociocultural context, making explicit the perspective of the subjects within the framework of their global discourse [20].

2.1 Sample

A total of 828 teachers from 1st to 4th grade of the elementary school in the regions of La Araucanía (IVE[1]: 85.5%) and Los Lagos (IVE: 81.1%) in the southern part of Chile, and Metropolitan (IVE 65.5%), in the center of the country, participated. The sample is representative, proportional to the national percentage of schools that had the following characteristics: 1) received state subsidy (municipal: 59.6% and subsidized: 40.4%); 2) belonged to the low and lower-middle SES, classified as Type A and B respectively; and 3) achieved performance above and below the average of schools in their same group and region according to national standardized tests (SIMCE). All participants signed an informed consent form after receiving information about the study.

The average age was 40 years (SD: 16.3) and 13 years of teaching experience (SD: 11.4). 83% of the sample were female teachers. A total of 88.3% had a basic education teaching degree. **Table 2** shows the distribution of the participating teachers by region.

2.2 Instrument

In order to collect teachers' beliefs about vulnerable schools, we asked, in the context of a broader questionnaire, the following open-ended question: "State four characteristics of a vulnerable school", which were to be completed in four blank rows provided for this purpose.

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[1] Index of educational vulnerability of the Region.

Region	Low-SES, High SIMCE	Low-SES, Low SIMCE	Lower-middle SES, High SIMCE	Lower-middle SES, Low SIMCE	Total	%
Metropolitan	53	42	156	115	366	44.2
La Araucanía	55	64	75	60	254	30.7
Los Lagos	39	39	75	55	208	25.1
Total	147	245	306	230	828	100
%	17.8	17.5	37.0	27.8	100	

Table 2.
Number and percentage of participating teachers according to the region, SES, and performance of their schools.

2.3 Analysis

The responses were processed through thematic analysis and semantic field analysis, in order to configure their beliefs. First, the corpus to be studied was established, namely "the four characteristics of the vulnerable school pointed out by teachers from four types of schools". Next, three evaluators read the transcripts and lifted the categories that emerged from the characteristics mentioned by the teachers. These were "students", "families", "teachers", "schools" and "social system". In addition, the textual extracts that exemplify them were selected. After comparison and establishment of coincidences, the extracts belonging to each category were joined and these were renamed using new labels to nominate each semantic nucleus (e.g., "low motivation to learn", "students with behavioral problems") included in the theme "students". Finally, the meanings attributed by the participants were discussed and the semantic field representing the narratives about the vulnerable school underlying the teachers' ideas was established.

3. Results

As shown in **Table 3** more than half of the mentions refer to families, with teachers and the system being the least mentioned. Students and schools are in between the two trends. We were interested to know what specifically they say about these clusters, are positive or negative characteristics mentioned? These questions motivated us to a second analysis of the data, which we carried out with thematic analysis and semantic field analysis**.**

The themes that emerged from the analysis of teachers' responses regarding students, families, and schools are presented in **Tables 4–6**, respectively. It is worth mentioning that there were no differences in the themes among the four types of schools. It is also observed that the teachers coincided in the order of importance given to each theme, which is reflected in the tables in the arrangement of these from left to right. Each table includes the distinctive features that describe each theme. Thus, for example, we have that the family (see **Table 3**) was the most mentioned actor, and of this, the theme most emphasized by teachers was the educational level of parents. A review of the features attributed to each theme allows us to see a rather negative conception of the children's group of origin.

Table 4 shows that what stands out most for the teachers is the educational level of the parents and the negative characteristics of the families.

Categories	Low-SES, High SIMCE		Low-SES, Low SIMCE		Lower-middle SES, High SIMCE		Lower-middle SES, Low SIMCE		Total	%
	F	%	F	%	F	%	F	%	F	%
Students	129	22.8	123	22.3	264	21.5	204	25	720	22.8
Families	338	59.7	330	59.8	705	57.3	456	52.3	1.829	57.8
Teachers	8	1.4	9	1.6	34	2.8	22	2.7	73	2.3
Schools	89	15.7	87	15.8	211	17.2	131	16.1	518	16.4
Social System	2	0.4	3	0.5	15	1.2	2	0.2	22	0.7
Total	566		552		1.229		815		3.162	100

Table 3.
Frequency and percentage of teacher references in each category of analysis.

Component/ Theme	Educational level	Family characteristics	Families commitment and support	Family composition	Cultural level
Families	Low level of education; illiteracy; no readers	Poverty; drug addiction; alcoholism; delinquency; violence and abuse; family problems	No commitment to education; low participation; low expectations; lack of accountability; neglect; lack of support	Dysfunctional; poorly constituted; single parent; disaggregated	Cultural deprivation; difficult access to culture

Table 4.
Themes and characteristics attributed to families in vulnerable schools.

Table 5 presents the themes and traits mentioned by teachers with respect to students. There is a tension between the recognition of negative dispositional aspects of the children, such as problems in learning and low motivation, in contrast with others that would be the product of external forces that would be causing great and serious damage to them. This tension could provoke contradictory feelings in teachers, perceiving them as difficult children, on the one hand, and as children worthy of compassion and pity, on the other.

The themes shown in **Table 6** reveal that teachers perceive their schools to be under constant threat from the conditions that surround them and that they feel are beyond their control.

Something interesting to note here is that teachers hardly mention themselves within the characteristics of a vulnerable school. Since there is no clear theme that can be attributed to a particular type of school, it is not possible to condense them into a table due to their low frequency. However, task overload, lack of professional development activities, and lack of collaborative work could be noted as some themes mentioned.

The great coincidence in the themes, the order of importance, and the features attributed to each theme led us to explore whether there is a semantic network that explains how teachers working in different types of vulnerable schools conceive of vulnerable schools. After analyzing the responses, we were able to identify a shared narrative on the topic (see **Figure 1**). In the first place, it can be seen that the school appears as a victim of the environment in which it is located and as the result of

Component/Theme	School retention	Readiness to learn	Motivation to learn	Behavioral aspect	Socio-emotional dimension	Socioeconomic characteristic
Students	High absence; school dropout	lack of habits; Special educational needs; Learning problems; low concentration; poor vocabulary; lack of early stimulation; study	Demotivation; low expectations, no vision of the future/ life project; Lack of compromise	Bad discipline; aggressiveness; lack of manners and norms	Parental neglect; loneliness; taken in by other family members; rights violated	Social risk; vulnerability; malnutrition; multiple deprivations

Table 5.
Topics and characteristics attributed to students in vulnerable schools.

Component/ theme	Social environment that surrounds them	Resources	Student characteristics	Selection
Schools	High social risk; conflictive sectors; high dependence on drugs and alcohol; delinquency; vulnerability	Lack of pedagogical resources; lack of technology; infrastructure problems; unmotivating environment.	High rate of priority children; low performance on national tests; high diversity	Not selecting its students; exodus of good students; high student turnover; low enrollment

Table 6.
Topics and characteristics attributed to schools.
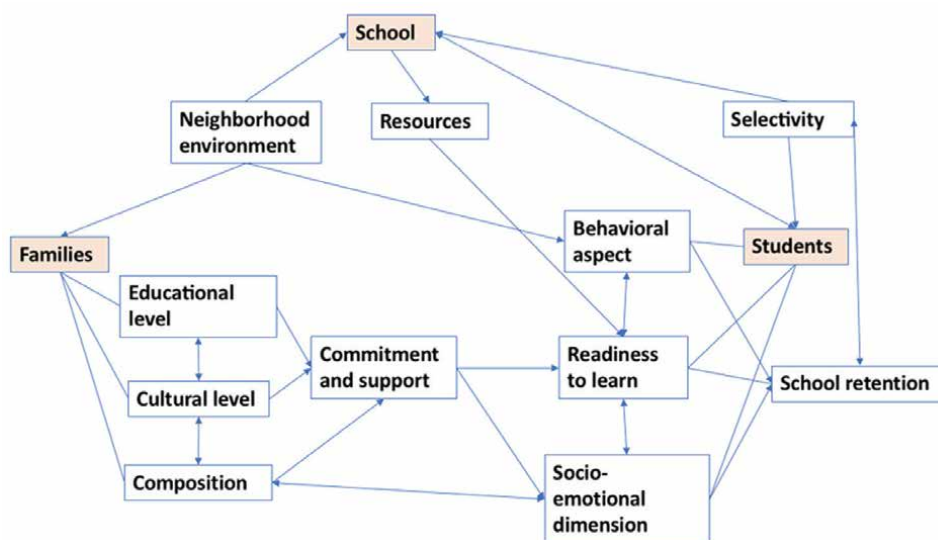
Figure 1.
Semantic network on the vulnerable school (own elaboration).

certain conditions imposed by the educational system that has classified it as a vulnerable school. Thus, the socio-cultural environment - which is seen as a place plagued by vice, violence, and crime - determines the bad behavior of the students and the type of family context offered to them at home, which would be the continuity of the external context. These negative characteristics of the family would in turn be caused by their low educational and cultural level and by their inability to change their living conditions given their dysfunctional nature, which are often single-parent families. These latter factors would cause a low family commitment to school and to the education of their children, to whom they would provide very little emotional support, which would have repercussions in the socioemotional area and in the disposition towards learning, preventing them from achieving good educational results. On the other hand, certain school conditions such as the lack of resources and the impossibility of selecting their students, lead them to feel obliged to accept all students feeling without tools to solve the serious discipline problems, learning difficulties, and low motivation to learn that will probably lead students to drop out of school.

4. Discussion

Our motivation for conducting this study was to find out whether there were differences in beliefs about poverty between teachers in vulnerable low and lower-middle SES schools with high and low performance on the national SIMCE test. Our premise was that schools with good performance, despite being in vulnerable contexts, would have more positive beliefs than those with below-average scores. Contrary to what was predicted, our data show us that there is a shared narrative that evidences a negative evaluation of the environment in which they work, which would confront them with problematic children and families that would prevent them from reaching the standards required by current public policy. Our reflection in the following lines will try to stress the effect of accountability policies on teachers' tasks and identity by configuring performance scenarios in which they must act strategically in order to receive the prescribed rewards or punishments.

Although the contribution of the SEP Law in terms of financing cannot be ignored, since it has made it possible to acquire technological resources and pedagogical material for schools, in addition to hiring new support staff (psychologists, special educators, and education assistants), increasing teacher hiring and training hours [21, 22] and contracting external consultants [9], it must also be recognized that it has had undesirable consequences for many schools in contexts of poverty by making them more visible due to the demand to show good results in the short and medium term. These schools have been popularly labeled as "vulnerable schools", which has implied the exodus of non-priority students to more selective schools and a substantive increase in private education [2, 7].

Under the neoliberal model, schools are not only evaluated and ranked according to a competitive logic but are also considered to be comparable to each other [23]. Unfortunately, comparison and competition require that someone always be at the bottom of the ranking [24] and the public policies developed in the last 40 years have left the public school associated with poverty [25]. On the other hand, due to the many demands associated with the results, teachers feel that national tests have standardized and bureaucratized their work, leading them to perform arbitrary and useless tasks [25], which does not allow the development of critical thinking, self-evaluation, and accountability, nor will it motivate school improvement and innovative thinking [23]. Worst of all, trust is placed outside schools, in agencies that are not efficient in sharing useful information for teachers, disempowering them from their expert judgment about learning [24]. When teachers perceive that policies restrict their professional autonomy, in addition to intensifying and deprofessionalizing their work, they adopt strategies of resistance to reforms [5, 25] and will most likely develop narratives of self-defense [23].

A perverse effect of incentive policies that encourage competition between schools and teachers is that they have stimulated individualistic thinking and strategic behavior that enhances personal productivity [26]. This has led teachers to calculate their efforts and to act according to external standards in order to achieve a positive and profitable image [9]. Another powerful effect is seen in institutions, which create school narratives that can strategically eliminate, debate, highlight or obscure scores, ranking and position in the hierarchy, to generate a sense of institutional success, as well as to justify or separate themselves from their indicators of underperformance, transferring responsibility and assigned blame for failure onto others, such as students and their families [23] (pp. 756–757).

Consistent with our results, many studies at the national level have collected negative attributions of teachers towards families, which they consider "poorly constituted", "dysfunctional" or "violent" [25]. They complain that families are an obstacle to their children's education, as they do not attend meetings, do not support homework, and do not collaborate with punctuality on arrival [27]. In addition, they feel overloaded with work because they have to start from the bottom due to deficiencies in home education, taking care of basic needs and personal care (cleaning, clothing, food); affective needs (due to precariousness and lack, mistreatment, violence, and abuse) and basic rules of behavior (punctuality, respect for the turn, asking permission), as there is much permissiveness and loss of authority and, in addition, the whole family is involved in drugs or crime [27, 28].

In social comparison, groups are evaluated according to their social status as a respected/unrespected group and liked/disliked by others. They are likely to be evaluating families as low social status and disliked group. This group includes people who fail, who are seen as parasites and abusers of the system, such as vagrants and addicts in general, who arouse emotional reactions of disgust and contempt, which may lead to attacking or neglecting them because of the great discomfort they arouse [29].

Rojas and Leyton (2014) have found negative attitudes towards priority students. Teachers are upset because they believe that the special subsidy goes directly to the child and not to the school. They also show some resentment with priority students because they feel that the law transformed them into "untouchables" by being prevented from making them repeat the grade [21]. In addition, they feel that the priority classification makes them deserving of multiple welfare "handouts", which is detrimental to non-priority children whose families work very hard. In other cases, a paradox is observed, as priority students are both desired and rejected [27]. They are desired because they mean a significant increase in school admissions, but they are rejected because they produce enrollment leakage and teaching difficulties.

Teachers consider students as "others" who are different from them and that, due to their cultural legitimacy, it is their duty to "culturize" them. They see them as "problem" children, aggressive, uneducable, who do not adapt to the educational system, and who must be domesticated [30]. They also feel that they must put aside pedagogical aspects in order to provide affectivity, sociability, and quality of life to students, but they also think that they only go to school to eat and play [31]. They think that their children are always hungry and lack affection and that their learning difficulties are related to poor nutrition, dyslexia, dyslalia, and psychological disorders that should have been resolved at the preschool level. These disorders would produce cognitive disorganization, limiting their development in basic skills such as describing, comparing, relating, and understanding [32].

It has been found that teachers in low-performing schools attribute the results to the physical and intellectual conditions of their students, drug addiction, and conflicts in high-risk neighborhoods, and therefore see little possibility of change [33]. In a study on diversity, it was found that teachers classify their students into two broad categories according to the origin of their learning difficulties a) those diagnosed with clinical pictures of permanent or transitory learning difficulties and b) those socially vulnerable due to low family cultural capital, the presence of alcoholism and drug addiction, delinquency, the absence of parental figures, abandonment and prostitution [34]. Teachers feel that they work with the most disadvantaged population, with the "*Cacho* children", those whom nobody wants [23].

Using the social comparison model, students could be evaluated by teachers as a disrespected but likable group, which includes those who are considered less capable

of managing their own lives because they have significant deficits or shortcomings, and for whom they feel pity, an ambivalent emotion that is both paternalistic and neglectful [29].

The effects of the policy of accountability have led to various consequences on teachers. On the one hand, it has technologized their work, deprofessionalizing it. On the other hand, it has aroused negative emotions such as fear of the permanent threat of closure of schools due to persistent underperformance [25]. But in the face of this bleak scenario, many turns to vocation to reaffirm their commitment to these schools [35] and raise their self-perception with a sense of sacrifice, altruism, and transcendence in their teaching action [25]. According to Assaél and Cornejo (2018), teachers feel trampled, repressed, and undervalued, but do not possess for the moment, a more elaborated reaction. In this becoming of subjectivities, many teachers wish that vocation begins to be part of the accountability mechanisms [25].

Unrest also stems from conditions that affect teachers' job stability. The ambiguity of neoliberal policies has increased "labor flexibility", making their work more precarious. For example, the Teachers' Statute allows termination of the contract or reduction of the working day with ease for the employer and the SEP Law reduced stability and hourly wages [26]. This has deepened the feeling of low valuation due to low salaries and work intensification, resulting in discomfort, anger, and fatigue [25]. Most teachers feel pressured and sued by these policies, in addition to feeling unfairly judged by society, because they appear to be responsible for the failure of the poorest students [5, 25, 36, 37].

According to Pascual Medina and Rodríguez Gómez (2018), subjects go through different levels as they become aware of power asymmetries [38]. These start from the first level of "submission" where "asymmetry" exists, but this is perceived as natural, given, and unmodifiable. A second level is "pre-critical" in which "inequality" is felt, in the face of which certain dissatisfaction and resentment begin to manifest themselves and explanations and causalities are sought. The third level would be "integrative criticism", in which one openly feels "injustice" and begins to analyze social reality with greater precision in order to propose actions for change. The last level would be "liberating criticism", in which after perceiving "oppression", the process of social transformation as such begins.

When considering the effects on the learning of the most disadvantaged students, accountability reduces the curriculum to the subjects measured by the standardized test, classes concentrate on rehearsing for the test, cultural and social diversity are considered as problems, and the integral education of students is renounced [24]. It is therefore paradoxical that the Chilean model is used as a reference of quality and an example of success at the international level [25].

5. Conclusions and recommendations

First, we can conclude that teachers have a common narrative about the vulnerable school. This means that the themes, traits and the effect that these variables have been transmitted almost unalterably from one group of teachers to another. We interpret this as a defensive response to the pressures of the neoliberal system that imposes classification categories that no school wants to be in and highly visible negative consequences that threaten the psychological and professional integrity of teachers. The struggle to survive in this scenario leads them to rescue small achievements or to distort information by shifting the responsibility for low results to students and their families.

The teachers' justification is that the degraded environments surrounding the schools are determining the type of families that bring their children to school and that their nefarious behavior would be affecting their children's willingness to learn. These discourses are further associated with feelings of pity towards the children and of disgust and contempt towards the families. In this study we see that teachers are only at a second level with respect to becoming aware of asymmetries, looking for causes of failure outside the school's responsibility, on which they feel they cannot act directly. We must support schools to move to the levels of integrative criticism and liberating criticism so that they can empower themselves by creating adequate solutions to the challenges they face and the ideals they can set for themselves as a community.

Before concluding, we would like to reflect on the title we used to begin this chapter: are teachers' beliefs the barrier to be considered in the face of the low results obtained by the poorest children? In our analysis, not only did we find a shared narrative without variations from school to school, but we were also able to verify the same narratives in other studies at the national level, all of which were carried out a few years after the implementation of these policies and continue to be reproduced to this day. This story is a barrier, indeed, but it is a way of showing the resistance of teachers to falling into disrepute.

Neoliberal policies in education are based on mistrust, as they postulate that only through incentives and threats will school and teachers mobilize to improve their quality. This causes teachers in schools with high rates of priority students to face stressful working conditions, such as intensified bureaucratic and meaningless tasks, super vigilance, and the obligation to cover the entire curriculum, in addition to preparing children for testing, which leads them to ultimately reduce opportunities for those who need it most.

We believe that there is an urgent need to transform accountability policies towards a notion that encourages school communities to engage in thoughtful and complex dialogs about school challenges and opportunities and ways to improve. Teachers should engage in ethical discussions about the daily practice of schools and promote both professional development and the actualization of democratic principles [23]. This is not only because their purposes and assumptions are not being achieved, but also because they impede the achievement of greater social justice. Intelligent accountability should be based on principles such as trust, dialog, school and teacher autonomy, equitable participation, high expectations, respect for diversity, contextualization, creation, and strengthening of school communities with their own identity, all of them as means for all actors to be mutually responsible for education [24].

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Conflict of interest

The authors declare no conflict of interest.

Author details

Viviana Gómez*, María Paz González and Pablo Gutiérrez
Pontifical Catholic University of Chile, Villarrica, Chile

*Address all correspondence to: vgomezn@uc.cl

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Chapter 20

Teaching of Natural Sciences Concepts to English Second Language Speakers in Primary Schools in South Africa

Nomaroma Kumanda, Shakespear Chiphambo and Nomxolisi Mtsi

Abstract

There are several challenges in teaching of concepts of Natural Sciences as a subject to isiXhosa speakers in primary schools in South Africa. This chapter explores the challenges of teaching Sciences Natural in English to isiXhosa speakers in the selected primary schools. The Bronfenbrenner's ecological systems theory was utilised. A qualitative research methodology was employed supported by the case study design. A purposeful sampling technique was utilised to select five different primary schools. Qualitative data were collected through semi-structured interviews and analysed thematically. This study revealed that Natural Sciences teachers use code switching for students to understand the scientific concepts that seem difficult to comprehend in English as a foreign language. Natural Sciences teachers indicated that policy makers do not involve them when planning the curriculum. The study recommends: (i) the curriculum to make a provision for teachers to start their lessons with what students are familiar with, (ii) Natural Sciences teachers to be familiar with the theories of language development for them to link the language with learning and teaching of Natural Sciences concepts through professional development programmes and workshops, and (iii) the Department of Education to ensure that it adopts the mother tongue policy for teaching Natural Sciences.

Keywords: Natural Sciences, teaching, concepts, English, second language

1. Introduction

Provision of basic information is not sufficient for expressive cognition and learning in Teaching Natural Sciences (NS) concepts. There is some old methodology of scientific ways of educating learners about scientific conceptions in which deficits occur in the teaching process [1]. Provision of students with meaningful additional elected experiences developed in a way that allows them to continue working on their ideas in a way that is more scientific and accurate is encouraged [2]. Apart from

language, students' sociocultural background also affects their understanding of science concepts [2]. The science teacher should, therefore, understand issues of language and students' background in the effective teaching of science concepts. To ensure that there is effective learning and teaching of science, it is the teacher's role to find ways to address language problems that may hinder students' conceptualisation science concepts. Teaching Natural Sciences concepts to students that are not familiar with foreign language is a challenge because of the students' environment. The language of instruction exerts significant challenges and demands extraordinary experience from students involved in learning science concepts [3].

Internationally, the teaching of science concepts in European schools such as Netherlands, France and Belgium meant to stimulate students' interest in science at a young age [4]. In the United States of America, [5] observes that English second-language students experience serious challenges in learning science concepts as science has a complex language that is difficult even for native English speakers to learn. Watters and Diezmann [6] call for the use of video instruction in teaching science terminology to students. Their argument is that before teaching a new science topic, the teacher should attempt to introduce new and unfamiliar terms, which students are using in the lesson. Video instruction becomes a very powerful tool as it exposes students to sounds and images, which stimulates students' emotional and intellectual curiosity.

In Malaysia, there are theoretical constructs that give insights into the implementation of science and mathematics teaching policy in primary schools [7]. Moreover, the aforesaid authors mentioned that the Malaysian government introduced learning language to teach knowledge and calculation at all levels of education but implemented in stages [7]. Learning through instructional language has weaknesses, which might affect the performance of the students. For example, adoption of second language speakers in English as a language of learning is a challenging factor.

A learning centre in Ghana considers education in the science field as a core component of the school curriculum. The Natural Sciences syllabus and Science education aims at equipping students through the compulsory development of talents and attitudes that provide a solid foundation for extra lessons in science. To achieve this aim, teachers need to use effective teaching methods in their teaching, as effective teaching makes a great difference [8]. Anastácio et al. [9] examined the application of the language of instruction policy in Science learning and teaching, and investigated the coping strategies of lower primary teachers in their use of their traditional language in concepts of science in teaching. The study revealed that home language is crucial during science learning and teaching. Learning is simplified in South Africa by using investigations and practical activity to clarify science topics as they go from the tangible to the abstract. As a result, it is crucial that the tangible foundations on which abstract conceptions are formed are sound [10].

Observing concrete objects and progressing to other process abilities such as classifying, envisioning, interpreting, and extrapolating give such foundations in scientific research. These skills are best acquired through practical activities, while concept building occurs through observation. This necessitates going beyond the textbook and making the most of the classroom setting by using demonstrations, hands-on activities and group work to increase student participation [10]. In the Eastern Cape province of South Africa, the exploration of subject creative arts was explored in the instruction of experienced learning-integrated strategies [11]. Views of experimental points together with the cognitive approach allowing students to study NS concepts were also revealed in the study. The present researchers are of the opinion that there

are diverse factors contributing to students' poor performance in Natural Sciences, for example, language of instruction, low literacy levels and systemic issues. Hence, the diverse factors need to be considered since they are crucial in the conceptual understanding of Natural Sciences.

According to [12], as children in South African schools reach the middle phase, they are exposed to a difficult science curriculum that needs higher-order thinking skills. Derewianka [13] elaborates on the lack of scientific language indicated by this study, arguing that students, regardless of their native language, require clear supervision because every day, spoken and academic written modes are distinct. Teachers have difficult problems when teaching and helping pupils who are learning a new language in such scenarios [14]. The present researchers, as experienced teachers in the field, argue that some of the teachers more dominantly use English than students' home language. Teachers must, however, treat both languages equally. This study looked at how Natural Sciences ideas were taught to English second-language speakers in a few elementary schools in South Africa's Eastern Cape Province. Ünsal et al. [15, 16] present the findings of a classroom research project in a bilingual science classroom where the teacher and students do not speak the same minority language, and the continuity between ordinary language and the language of science is construed. They investigate how bilingual children comprehend linkages between every day and scientific language in a classroom where all pupils spoke a different language and the teacher spoke a different language, both of which were minority languages in their language schools. A language approach emphasises the need of looking beyond the traditional conception of named languages as various codes of speech and writing, particularly the physical and multimodal components of communication [17, 18]. They have both studied the importance of taking advantage of the affordances of language as a pedagogical resource to improve topic teaching and learning in science classrooms using English-medium instruction (EMI).

Professors must evaluate students' context and limits before making changes to their school programmes [19]. They agreed that instructors need to be trained in educational platforms that integrate technology and that the government must support legislation that formalises virtual education by providing schools with the necessary tools and resources to satisfy their demands. The findings of [20] reveal that science instruction is influenced by "contextual factors such as classroom environment, learner commitment, learners' language competency, and resource availability." And other elements, mostly contextual, influence the efficacy of science teaching in the South African environment. Gumede [21] created a teaching and learning environment that allows learners to acquire skills and knowledge in a way that improves their lives by focusing on knowledge from real-life issues that are part of learners' everyday lives in their communities [22].

2. Research questions

The research questions guiding the study were as follows:

• How are Natural Sciences concepts taught to English second Language students in primary schools?

• What instructional strategies are utilised in the learning and teaching of Natural Sciences concepts?

3. Theoretical framework

The link between the intended and implemented curriculum lies at the heart of this study's theoretical approach. A suitable theoretical approach for better conceptualisation of the study is drawn from [23] eco-systemic theory. A better understanding of the science field environment of learning in a way that promotes positive learning regarding additional language is clearly highlighted in this theoretical model. Reyna [24] reflects on the concepts that are key in providing a perception that learning and teaching relate more in the process of making transformation possible in the knowledge field. Differentiation that relates to systems that are unique pertaining to teacher experiences when we point more in delivery and preparation of lessons for learning exist. Bronfenbrenner's ecosystem, as an approach, was utilised for better identification of the external processes, which influences teachers' experiences.

4. Methodology

A qualitative research methodology was employed guided by the case study research design. Qualitative data were collected through semi-structured interviews which involved the five purposefully selected Natural Sciences teachers. The data collected were analysed using thematic analysis where the responses were grouped and coded and then, themes were derived. All ethical measures were taken into consideration including informed consent, freedom to withdraw, confidentiality and anonymity, privacy and empowerment, and care and fairness. To identify and eliminate any potential risk to the participants, a protocol was followed. To conduct the research, an application for ethical clearance was acquired. To ensure data credibility of the study, the member checking technique was employed by allowing the participants to determine whether their ideas and opinions were presented accurately.

5. Discussion of the findings

This section presents data gathered using individual interviews with NS teachers. Data are presented using themes and sub-themes drawn from narratives to answer the research questions and gain a deeper understanding of teaching NS concepts and verify reviews using open-ended instrument responses. The main theme on strategies employed by teachers in teaching NS concepts generated other sub-themes, which included instructional strategies by teachers, assessment strategies commonly used by teachers, qualified NS teachers and availability of NS teachers.

Table 1 represents the division of themes into sub-themes, the related issues and the findings.

5.1 Instructional strategies employed by teachers

The case of code switching ensures that students have an alternative to using mother tongue, which becomes a medium of communication. Code switching is a strategy employed by teachers, in this case NS teachers as confirmed during teacher focus group interviews:

> *Teachers do their best they even break meanings into their level of understanding (T3).*

Theme and sub-themes	Related issues	Findings
Strategies employed by teachers in teaching NS concepts: instructional strategies employed by teachers (code switching)	Teachers use both isiXhosa and English when they are teaching. Teachers acknowledged that learners were struggling with the English language. Teachers were quietly aware about LoLT. Code switching encouraged and motivated students to learn.	Teachers presented scientific instruction in isolation without considering the meaning of science concepts. Teachers confirmed the challenges that made the teachers end up code switching all the time.
Assessment strategies commonly used by teachers	Assessment cannot be divorced from the teaching and learning process. Strategies used are homework, group work, assignments, projects and tests.	English language contributes to the challenges in science learning. Students cannot follow scientific instruction.
Qualified NS teachers	Teachers are qualified as professional teachers for any learning area or subject not specifically as NS teachers.	The challenge of code switching from language of learning and teaching to home language (isiXhosa).
Available training of NS teachers	Problem experienced was lack of training. Teachers learnt on their own most of the time. Official teaching for teachers is essential.	Confirmed that as much as teachers encourage students to learn scientific subjects, students explain things more easily when using their home language (isiXhosa).

Table 1.
Theme and sub-themes, related issues and findings.

This seems in the responses supportive with the declarations such as:

> *I switch between languages (use more than one language) to help the students to learn the NS concepts in English and understand the content of the subject, and group discussions (T4).*

The practice is that many teachers employ code switching to make learning of NS concepts easier. However, the issue of the code-switching strategies utilised in this case is that for effective learning, special emphasis must be paid to employing language that is appropriate for isiXhosa students. Students are at risk of misinterpreting scientific interpretations, such as when terminology in colloquial English has different meanings than in academic English. According to Swedish research by [15], students in chemistry education interpreted the word solution to mean and solution to a problem rather than chemical solution. Lin and Wu [17] emphasise the need for connecting everyday language to scientific language and themes, as well as encouraging students to vary between discourse styles. This supports [25] research in Nigeria, which found that using code switching in a multilingual mathematics classroom does not result in a learning deficit, but rather is a valuable method in classroom interaction and an efficient manner of conveying knowledge to pupils. This means that learners are effectively taught bilingually. Teachers must be confident in this situation, as it needs the educator to be fluent in the student's native language. Lack of assistance during assessment shows the need for teaching strategies for teachers to code switch to accommodate non-English speakers.

5.2 Assessment strategies commonly used by teachers

The researchers' intention was to investigate the assessment strategies used by teachers on teaching NS concepts. All the NS teachers were quite clear about what the concepts involve. When requested to give their understanding of assessment strategies, teachers mentioned how they use assessment to encourage students to perform to the best of their abilities, using different assessment strategies:

> So when we do our prep, even when we draw up activities, we make sure that we use simple English to accommodate our students because we know that they may not get the answers even if they know because of the language (T1).

> As much as we lack the material, we make sure that we use books that have the pictures so that even if the students did not have an idea they may see the picture (T3).

> And we do a lot of revision, we're just doing revision to prepare them even if they don't understand the meanings. Most of the time we use to we give them another opportunity to improve their mark (T4).

From the comments, it was evident that assessment is how teachers learn about their students' performance and the quality of their learning. Assessment occurs during the learning and teaching process to support, assist and diagnose the learner's strengths and weaknesses. According to [18], monolingual language evaluation techniques punish those who may have a larger linguistic repertoire overall but have not learned the competence of limiting their language use to only the aspects specified for the assessment's dominant identified language. According to [26], one strategy to encourage learners to 'practice' authenticity is to employ authentic resources in the tasks they are given, where they can authenticate their language use by relying on their own language communication skills. To incorporate an English approach in language education and, as a result, increase learners' awareness, traditional materials such as course books or grammar books should be supplemented with a variety of real outside-of-classroom resources that highlight the various manifestations of English.

5.3 Qualified NS teachers

The teachers referred to their own teaching experience as important when asked about their qualification on teaching NS.

> During the allocation of duties, I was allocated to teach NS without looking at any qualification (T3).

> It is a personal issue to answer on how or when I qualified to teach NS (T5).

All the teacher respondents displayed discomfort when asked about their qualifications; specifically regarding the NS subject, they only indicated their teaching experience and training years. In addition, they supervised the Intermediate and Senior phase (INTERSEN), whereas grade seven is the last class in primary school. Only by developing professional standards that specify an 'effective' teacher's learning path throughout their career can teaching quality be improved. This is comparable to what [16] discovered in newly qualified primary school teachers who had issues with time allocation

for teaching sciences. Except for one instructor with the least number of years in the teaching profession, this is corroborated by the number of years in the teaching profession. Thus, the challenge is the number of years in teaching NSTECH as an integrated subject to English First Additional Language grade four learners [21]. Teachers will need to help students build their ability to open a new area for using English creatively, based on their particular linguacultural background and experiences [27].

5.4 Available training of NS teachers

In the response with the five participants on the interest of training for better quality in science learning and teaching, the majority refused and the minority agreed that training will assist the learning and teaching skills. A teacher's level of education and training may encourage the content of approach to learning and teaching of NS. One-on-one interviews were used to collect the effect of NS performance on workshop attendance. Responses by participants revealed that:

> *He is an acting deputy principal and teaching NS subject, confirming that workshops play an important role whereas they were scarce. In that note he also suggests that availability of workshops can make their work easier for teachers. In addition, he emphasized that the way of using learning material depends on workshops so that they may use them accordingly (T4).*

> *Resources are essential in line with the availability of workshops in order to make things easier so that learning and teaching takes place (T1).*

There are factors that contribute towards NS performance through improving workshop attendance as indicated by teacher responses.

Some of the teacher participants showed a negative attitude when asked if there was availability of trainings or workshops that could help with NS teaching:

> *I did not attend any NS workshop as the only thing I used to attend is a moderation where the subject advisors just moderate the work we already have without doing the 'how to teach' workshop (T3).*

It was also commonly alleged that teachers involve creativity in terms of learning and teaching of NS concepts. On the focus of the study, which is the teaching of NS concepts to English second-language learners, teachers and students show some different views on strategies employed by teachers in teaching and learning.

The evidence showed that teachers had limitations in the training process, which made it challenging to develop and transmit information that would facilitate joint learning and teachers' training. Those factors have affected the efficiency of the teaching process and career development. Knowing teachers' challenges and how to solve them will provide information that will help to equip future teacher trainees to cope with similar challenges. Blomgren [28] indicates that training programmes should give teachers the necessary knowledge and skills to find and evaluate appropriate, specific language, discipline, subject and educational level. Contreras et al. [19] conducted a study regarding the value of teachers' training on platforms and technological tools used for linguistic purposes. They recommend that the universities that train English teachers should consider including Content and Language Integrated-Learning methodology as one of the topics in their curriculum of English foreign language teacher training programmes.

5.5 Learner-centred strategies utilised in the learning and teaching of NS concepts

Sub-research questions for the study sought to establish the learner-centred strategies utilised in the learning and teaching of NS concepts. Findings from interviews revealed the strategy of using students at the centre when teaching is an innovative idea. According to CAPS, the involvement of students in a lesson is important for optimising learning. Students should play an important role by engaging in the main idea instead of having a teacher assist them during the learning process. In South Africa, according to the National Curriculum and Assessment Policy Statement, 2014, students should be taught how to read independently and avoid inculcating knowledge without knowing the meaning of the text. This prepares the students to be diligent readers without anyone supervising them. This is to further the goal of the South African curriculum to enable the students to learn and do classroom activities and focus on education as emphasised by CAPS. A different teaching approach put forward by [20] claims that inquiry-based science allows teachers to be more creative while also enhancing pupils' ability to understand science concepts and procedures. In addition, teachers assume that students now have a much better understanding of the topic if they engage in code switching.

6. Conclusion

In conclusion, both teachers and students encounter challenges when it comes to the language of instruction which is not their mother tongue. Ultimately, the language of instruction continues to be a learning barrier in the teaching and learning of science subjects.

7. Recommendations

- Based on the findings of this study, the researchers propose the following recommendations to improve the teaching of NS concepts to English second-language students:

- The curriculum must make a provision for teachers to start their lessons with content that students are familiar with;

- Natural Sciences teachers must be familiar with the theories of language development for them to link the language with learning and teaching of Natural Sciences concepts through professional development programmes and workshops.

- The Department of Education must make sure that it adopts the mother tongue policy for teaching Natural Sciences.

8. Limitations

The limitation of the study is concerned with the sample, which was based on the school component which involved teachers and students. Other components

of the Department, which include the district curriculum component such as subject specialists, were from the school perspective, which excluded science subject specialist information.

Conflict of interest

None of the authors has conflict of interest

Author details

Nomaroma Kumanda*, Shakespear Chiphambo and Nomxolisi Mtsi
Walter Sisulu University, South Africa

*Address all correspondence to: nkumanda@wsu.ac.za

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Chapter 21

Transdisciplinary Art-Science Identities and the Artification of Learning

Kathryn Grushka

Abstract

Transdisciplinary art-science learning is linked to semiosis and the performative nature of learning. At the core of contemporary learning is sensemaking through images. We learn through how we perceive, remember, and imagine the world. An ethics-approved inquiry looked at the artmaking practices of gifted secondary school students between the ages of 15 and 17 years (n = 108) with a focus on their art-science performative learning. The study applies Deleuzoguattarian thinking and other post-structural perspectives on contemporary representational practices for learning and communication in art-science spaces. One of the research key findings is that artified visual pedagogies can both transverse and/or facilitate meaning-making across art-science spaces and brings forth the creation of science-linked identities. Educators must now engage with the idea that visual reasoning as performative action is now the connecting pedagogy in all epistemic fields.

Keywords: science-linked identities, visual borderlands, transdisciplinary learning, art-science, semiosis, artification, visual learning, science communication

1. Introduction

There is an emerging watershed moment that is set to challenge the relationship between dominant text-based instrumentalist imperatives of the last century and visual art and science education in transdisciplinary learning spaces. With the ideas of contemporary post-structural philosophers such as Deleuze and Guattari entering educational discourse, visual performative thinking and semiosis are forging a rethink about knowledge and communicative connections between disciplines [1]. As our artefactual world now centres on the image, what we come to know as experience and learning are being redefined by how we perceive, remember, and imagine the world as images and signs. Educators must now engage with the idea that visual reasoning, as performative action is now the connecting pedagogy in all epistemic fields with the capacities to visualise, transform, and communicate information.

The chapter argues that the concept of visual borderlands has the potential to unmake current constructs of both traditional art and science curriculum and their related pedagogies by exploring the liminal, embodied, and artified knowledge spaces

emergent in their borderlands. This has significant resonance as neoliberal ideology, promotes certain student/teacher behaviours in the name of creativity [2], and has become intricately connected to making a scientific workforce and presenting a dogmatic image of thought about scientific knowledge [3]. This chapter seeks to loosen such ways of knowing in science education in the consideration of the role artification plays in contemporary science learning. I write this at a time when pedagogical rhetoric across secondary and higher education is shifting to a focus on the importance of transdisciplinary knowing yet remaining anchored in positivist text-based assessment and teacher-centred content. Ironically, policy and debate on pedagogical futures which speaks to student-centred inquiry and knowledge connections continue to have the side effect of the neglect of the arts generally, and specifically visual contemporary arts practice which accesses all signs and epistemological contributions as artified ways of knowing and being when inquiring and when communicating to audiences.

Current pedagogical challenges are heightened by everyday digital imaged technologies and their semiotic complexities. These imaged technologies provide agency and fluid learning opportunities for all youth. The next education frontier must look to the significance of the visual, its visual learning processes, and its semiotic contribution which grounds personal experience, aesthetic, affective, and performative learning. By drawing on the Deleuzoguattarian method as one of intuition, it is argued that visual boundary learning goes beyond the actual and our limited, or fixed forms of representing life, to recognising that we are always seeing [4] with affective and imaginative potential. Drawing on gifted secondary school visualisers enrolled in a commencing introductory first-year university fine art 2D course, it seeks to provoke accepted constructs of traditional visual art and its more contemporary contribution to learning. Within this course, students were asked to explore a scientific concept of choice and straddle subject borderlands. The inquiry examines the extent to which scientific and arts-based learning has the capacity to de-territorise knowledge. In so doing, it brings to the surface the concept of an artified pedagogical perspective. Artified learning is linked to adaption and aesthetics and, in the spirit of transdisciplinary learning, presents insights into new ways of seeing or imagining future pedagogical connections and possibilities.

2. The watershed moment: neo-liberal education and the fluid performative realities of being a digital visual learner and communicator

There is a coalescing of current educational commentators critical of the current instrumentalist and positivist knowledge perspectives on pedagogical design which will have ripple effects on society into the future. Four key ideas are presented and will be foregrounded in this chapter: (i) scientific commentators who challenge the hegemonic dominance of the contemporary positivist idea of fixed scientific representations and teacher-centred pedagogies; (ii) the performative nature of learning which links percepts and affect, becoming and the multiple ways we make meaning; (iii) the digitisation of social media, dominated by the visual, its fluid processes, unstable meanings, and artful semiotic practices; and (iv) the concept of visual borderlands [1] at the heart of transdisciplinary learning where the learning is affectively driven, relational, and connected. A pedagogy offering imaging as a valued liminal space sees visual borderlands as being able to connect knowledge, identities and employ metaphor across epistemological boundaries for new understandings.

In the first watershed moment, a rupture now exists between our understanding of the need for transdisciplinary knowledge diversity and associated learning assets and a perceived excessive focus on dis-imagination in quest of vocational and science, technology, engineering, and mathematics (STEM) education [5, 6]. Commentators like Yong Zhao [7, 8] speak to the unintended side effects of such economic education policy narrowing society's skills and talents/interests as non-STEM skills are undervalued. He argues against a focus that educates uselessness to one with a focus on creativity, resilience, and talent diversity. Zhao emphasises specifically the ways of knowing offered in the arts. Ways of knowing that refine interpersonal, intrapersonal ways of knowing, and their intrinsic, aesthetic, critical, and communicative skill sets are central to contemporary subject-objective reality. Lovat [9] further draws attention to the pedagogical challenges of dominant positivist/instrumentalist pedagogies and their learning limitations emphasising that knowledge is never generated in isolation but is dependent on how the learner effectively receives and understands the knowing. Indeed, there is resistance to the assumption that education is just about producing a scientific workforce. Commentators on art-science, creativity, process pedagogy, and learning continue to argue against the marginalisation of some students towards a consideration of the idea of 'science-linked identities' [10]. They argue for the removal of subject borders [11, 12]. Given the agency of digital culture, and the way young learners both effectively [13] and cognitively access visual reasoning visual representations are now considered a significant cognitive tool both effectively [13] and cognitively access visual reasoning is now considered a significant cognitive learning tool [14]. The siloed nature of the curriculum and the de-imagination of learning occurring in neoliberal education simply performs the task of using education to train workers for service sector jobs and to be cultural consumers with the rhetoric of being able to straddle the development of self-knowledge and citizenship.

The second current arises from a philosophical and research shift that acknowledges the performative nature of learning that links subjectivity and autopoiesis to machinic ecology [15, 16]. Deleuze and Guattari [17, 18] speak to subjectivities and the multiplicity of ways in which we continuously connect our past and present in future orientations. These ways of knowing are always shifting in a process of learning and becoming. They reference autopoiesis which presents sensemaking or meaning-making in nature as a living machine, continuously replaced in pursuit of a self-referentially organised ecology for adaption [19]. For Guattari [20] autopoiesis operates within a machinic ecology which is greater than our biological being. It is an ensemble of conditions or a machinic assemblage where all the components are relationally and transversely connected. A machinic ecology is defined by Guattari [20] in his book 'The Three Ecologies' which speaks to 'a machinism that has technological, social, semiotic and axiological avatars' (p. 34). Contemporary communication, education, and culture are also identified in this dynamic ecology and rest on a relational ontology [21–23] that has no clear boundaries. Furthermore, it has shifted the emphasis in which language and communicative action have typically played a central role towards a performative approach that holds that truths, realities, knowledges, relationships, literacies, agency, and identities as performed in and through material-discursive practices [24]. Milovanovic and Medic-Simic [25] extend these ideas drawing on self-organisation in complex systems physics in their study of neuroaesthetics and artmaking, stating that contemporary art practices, with their postmodern aesthetics, consolidate both art and science. Commentators on Deleuze and art research present contemporary art as a practice that dwells in the transcategorical and transdisciplinary, or liminal spaces between historical and contemporary representational practices [26].

Acceptance of the cognitive and affective work images as meaning-making tools do in both the arts and sciences is required if we are to extend our current limited ideas on transdisciplinary learning. Images are used for visual observation as perceptual and experiential knowledge bridges and include representations, both material and virtual. Both art and science carry multiple common semiotic structures, such as diagrammatical and metaphorical practices which Root-Bernstein et al. [27], sees extends the correlation of thinking skills across art and science.

Art and science have always been close. The images in show how visual representations, across art and science, are historically, relationally, and transversely connected and codependent on the sociocultural and technological skills of the day. Driven by new media and communication imperatives, the representations of knowledge are increasingly digitally enhanced and open to fluid interpretations and uses. Visual communicative competency as sociocultural learning is now an essential skill across all disciplines and significantly in science [28, 29]. Pauwels [30] commenced the discussion around the unstable or interpretive nature of visual scientific communication, the processes and methods by which they are produced, and how scientific images, through their repeated copying, have been normalised as fixed across learning and communication contexts. She draws attention to the inscription, transcription, invention, and fabrication of scientific images across algorithmic and non-algorithmic representation practices such as the use of the camera or X-ray and the role of scientific illustration ([29], p. 149). These ideas have more recently been extended beyond the science of communication to science communication where writers seek to address questions about ontology, such as what is real or true, and how scientific ways of knowing or epistemological points of view or lenses are used to initially capture reality, and then how they are used by social media or the wider society for the communication of ideas [31].

The third consideration informs the first two considerations and is driven by the benefits of artified digitisation. Communication and learning are increasingly propelled forward by the new image-based economy with new knowledge in the sciences and arts increasingly conscious of the flow of signs and images destabilising knowledge [32]. All images are now aesthetically curated and culturally situated within social media. Dominated by the visual and its semiotic complexity, we are all participants as actors, producers, and consumers of information [33]. Digital online photo-sharing and videoing acts now creatively and intuitively connect all experiences and representational knowledge from all discipline fields. These images effectively trigger and connect content and contexts to individual learners [34].

Science education has traditionally focused on conceptual or factual understandings when using visual representations and less on visual representations as epistemic objects for scientific identity [35]. There is a renewed focus on how visualisation contributes to knowledge formation in science from the learners' perspective. It is acknowledged that epistemic representations as boundary objects are incomplete and precipitate an unfolding [36, 37]. Increasingly science educators seek to disrupt the currently accepted normalisation of scientific images as fixed truths or facts. Pauwels [29] asks the science educator or the observer to question what is revealed, obscured, included, or excluded, in these representations. She also asks that we pay attention to how scientific illustrators now readily adapt their images, reframe them for an increasingly wider audience, that of producers or consumers as represented in **Figures 1** and **2**.

Science educator-researchers have begun to respond to the shifting demands of new digital communicative and multimodal semiotic realities of the classroom
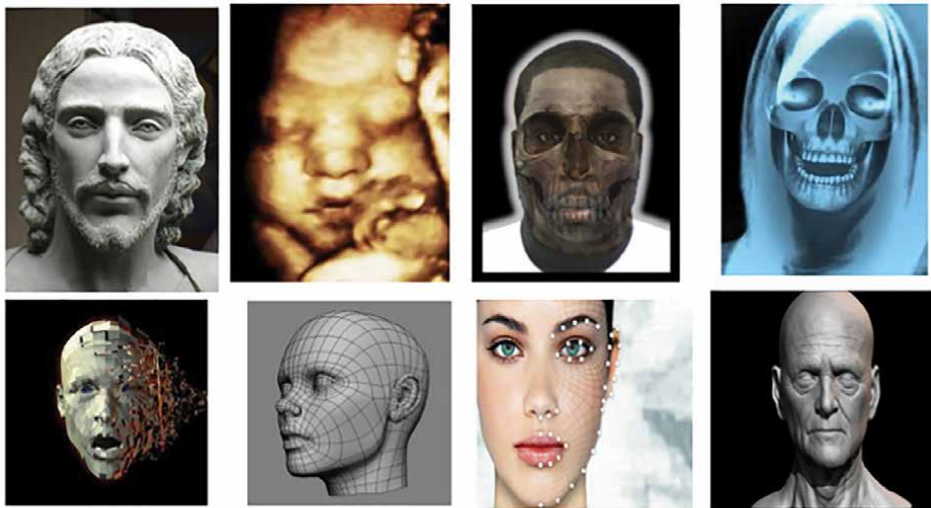
Figure 1.
The materiality of things: Takes us beyond words (Grushka, 2019).
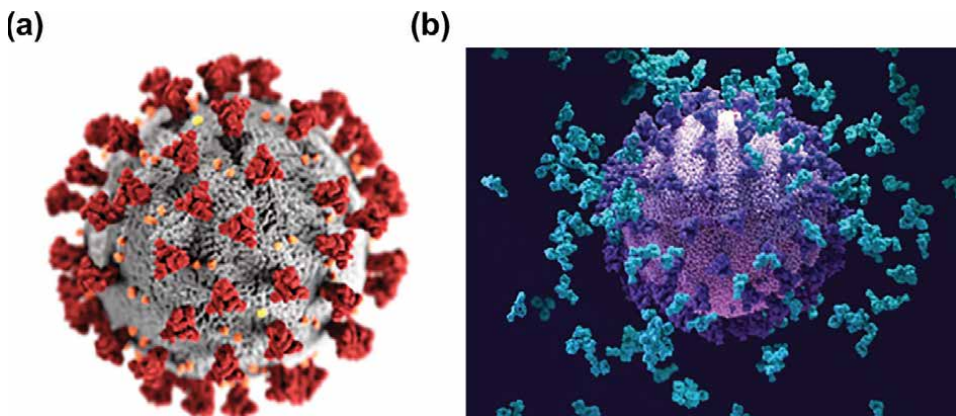
Figure 2.
Depictions of the COVID-19 virus.

learner. In doing so, they are identifying the limited visual literacy and visual communicative skills of their pre-service teachers [38]. Leßmöllmann and Gloning [39], arguing that there are indeed diverse communicative responses required when seeking to connect multiple relationships between scientific knowledge, audiences, and work. Scientific contemporary communication to the public can inform, influence, and even negotiate the science via new social media platforms. It is inevitable that the social and cultural realities of the world of work and the WWW will collide as the vast world of images and their performative and semiotic intersections cross all subject fields.

Transdisciplinary learning for knowledge production and as a communication enterprise is a process of semiosis. Semiosis is a sign or meaning-making process with a choice to select [40]. It is the continuous production, translation, and interpretation

across all societies of everyday signs. Human communication thus engages in dynamic relations formed by the human mind and its cultural artefacts [41, 42]. Semiosis is presented as an assemblage or bricolage of different semiotic codes used to build communicative coherence in the contemporary learning culture. It is increasingly identified as affective as we invest in the world via our intentionality, habits, and prejudices [43].

Scientific representations have entered mainstream media with normalising social and cultural traction, such as the COVID-19 virus.

The media-driven scientific culture acknowledges that the algorithmic image of COVID-19 is aesthetically enhanced through artful acts. In **Figure 2**, the SARS-CoV2 image describes the antibodies and is enhanced as light blue. It also acknowledges it as an artist's impression [44]. These images have intentional affective traction as contemporary scientific image makers use artful intuiting representations, such as colour to help in the communication of concepts, abstractions, aesthetic insights, and design orientations that seek to immediately bring forth 'effects' from the audience. These 'effects' can be passive or active and are dependent on an individual's 'seeing' within their personal, social, and cultural context. This seeing is shaped in part by epistemic insights and multiple learning contexts [45]. Such a shift in thinking about the work of scientific images in learning and understanding their knowledge complexity, their performative nature, and interpretive possibilities, is currently a pedagogical challenge as re-imagining transdisciplinary pedagogies and its assessment continues to prove difficult [38].

The concept of artification, as adaption is an important concept when considering the rapid speed with which images are created, modified, and communicated. Artification, emerged from the work of Dissanayake [46] which was deeply grounded in evolutionary anthropology and psychology. It presents art as behaviour and its verb is to artify. It has been subsequently re-set or redefined in contemporary discourse as a sociocultural process located in time and space [47, 48]. The processes of artification, as defined by Shapiro, within a post-positivist paradigm, carries the attributes of meaning which may include displacement, renaming, the shifting of categories, organisational and institutional change, functional differentiation, redefining time, legal consolidation, patronage, aesthetic formalisation and intellectualisation ([48], p. 267). These processes are not the limit of possibilities and Saito [47] argues that artification must maintain a critical stance if it is to promote new ways of thinking and doing. Ways of thinking and doing that promote creativity, imagination, spontaneity, passion, and innovation towards a re-imagining of learning that can break away from the use of normalised images, goal-centred planning, and text-dominated assessment in curriculum.

The concept of visual borderlands is the fourth and final concept and is presented as a new way of thinking as experimenting about relational and connective concepts in transdisciplinary learning. This has been a key finding of the art-science research previously reported and extended in this chapter. The concept foregrounds the productive and performative role of imaged learning identified by the researchers. Visual borderlands in learning are the liminal spaces that are ever-present when students work with images to represent their knowledge. By their very nature, images dwell between the borderlines of art and science and carry a relational aesthetic. Visual borderlands are fluid spaces where the historical representation practices, all now virtually accessible, can hold past knowledge that can all co-exist with new imaging acts. To give meaning and form to emergent concepts, artists and scientists alike draw heavily on metaphor because metaphor can support this indeterminacy when confronting new ideas. It is in these visual borderlands that the generation and communication of ideas in transdisciplinary learning are shared between students and with teachers.

Indeed, visual borderlands extend the earlier sociocultural claims by Mirzoeff [49] that vision and visuality would shape how we choose to see ourselves and others in the production of subjectivity. Visual borderlands and the skill of visuality, or critical visual literacy, have now spilled over to an educators' understanding of the way all young learners, 'capture' experiences, select images and concepts to be explored and communicated. These imaging acts are performative. In the processes of communicating their lives via mobile and digital devices they continuously engage in a process of image juxtaposition to explore 'the existence of the encompassed possible' ([50], p. 347). This student-centred learning is the core of visual art studio classrooms.

Visual borderlands identified in the research to date embed arts-based inquiry pedagogies with the affordances of a fusion of ideas and concepts from many knowledge areas, across the sciences, culture, and society. The skills developed in arts-based learning tolerate and are driven by the conceptual and visual communicative learning process. As identified, they operate at visual borderlands between arts and science, access other semiotic systems, and offer creative and personalised approaches to learning [51].

3. The inquiry into visual borderlands

The ethics-approved longitudinal inquiry looked at the artmaking practices of gifted secondary school students between the ages of 15 and 17 years (n = 108). The students were selected to participate in a first-year 2-D fine art course at an Australian regional university. The course focuses on visual reasoning, arts-based inquiry as a research [52–54]. Students were selected across a range of regional secondary schools.

Year	Regional secondary schools	Participating students
2015	4	20
2016	6	23
2017	5	21
2018	6	22
2019	7	22

Students were given the opportunity to do an individual arts-based research project where they take a personal problem-centred approach to their inquiry. Broadly, this inquiry focuses on the transdisciplinary meaning-making processes of young visual art students and how they approach and explore a scientific concept or phenomenon of choice, through arts-based research. Students have been selected by their art teachers, interviewed, and subsequently invited to enrol in the university course while concurrently doing their school studies. Students keenly accepted the challenge of the additional workload because generally, they saw learning through imaging acts as a preferred way to learn. The inquiry into the art-science learning in the gifted education program has run at the university from 2015 to 2019. The students draw on their school-based science learning and personal scientific interests, but drive their inquiry through individual troubling about self, art, the world, and their own expressive meaning-making processes. This chapter draws on the work previously done on visual borderlands [1] and considers how performative artification operates in the works of two students, Charlotte and Aynsley. They are two of the gifted visualisers.

The inquiry *applies a* Deleuzoguattarian lens and draws on arts-informed qualitative inquiry research methods [55, 56]. It presents the learning as material, non-linear, non-hierarchical, unstable, shifting, mobile, and multiple forms of knowledge [57–59]. The data sources informing the inquiry include the student artworks, their visual diaries as performative sites, student surveys as reflective insights, student focus group interviews, and audience survey feedback collected at each final exhibition. In this chapter, consideration is given to how students engage at subject borders between self, art, science, and their broader sociocultural world. In particular, it will consider how the students traverse the boundaries between arts and science, how they draw on different artistic and scientific representations and apply visual semiotic and artified pedagogies.

3.1 Visual borderlands as artified assemblages: Charlotte and Ansley

This section explores the intersections between the student artefacts from the arts-informed interpretive inquiry and embeds the concepts from the literature in seeking to extend the definition of visual borderlands as a liminal art-science trans-disciplinary meaning-making space. This lens brings to bear the shifts in thinking about what constitutes a learner's scientific identity amplifying the voices around the semiotic work that folds across learning assemblages in both visual education and science learning. The analysis looks at Aynsley and Charlotte's personal inquiry into their selected scientific phenomenon. It considers their unique problem-centred learning processes identified in the artefact analysis. These artefacts provide glimpses into the students' ideation and incorporeal thinking which Deleuze describes as the process which is indivisible, and ideation brings forth effects transferred into their artmaking. It will look at connections to past and present semiotic meanings with consideration of their future-oriented subjectivities at the boundaries between arts and science.

3.1.1 Aynsley

The work of Ansley connects us immediately to the world of entomology. A study of her final drawing below pulls an audience into considering the connections and relationships between humans and insects. Is the question she wishes the audience to ask or to consider, the evolutionary, ecological, and biodiversity issues that face humanity? Where does this question sit, in science or sociocultural inquiry? Will the evidence offer opportunities to consider what a contemporary learning culture of the science classroom might look like?

Aynsley's artist statement below sees her dwell on issues of vulnerability for humanity, the world of living things, and the environment.

> *My study demonstrates the relationship of art verses science through the study of entomology...combining butterflies and the human form. As an artist my goal was to express the unique nature and vulnerability of each and everyone of us...these artworks symbolise beauty and how it defines us. We are all equal... it shows how people can interpret beauty in different ways.... For some, the wings could be the focus point and others would believe the eyes capture the viewers opinion on appearance (Aynsley: Artist Statement, 2018).*

For Aynsley, there appears to be no separation between humanity and nature, no species hierarchy, all be this is not clearly articulated in her artist statement, but

possibly implied by their juxtaposition. She states clearly that human and butterflies are equally vulnerable. Her intertwining of the butterfly and the human eye is bound by the aesthetic materiality and affective rendering of the wings and eye towards an aesthetic likeness, or possible oneness (**Figure 3**). The observer can see in her diary entries, displayed as an assemblage created by the researcher (**Figure 4**), that she follows some of the fundamental non-algorithmic scientific observational and experimental methods, such as species identification and classification of insects called lepidoptera, butterflies and moths and drawing as illustration. The processes of artification displayed could be seen as a re-classification, or shifting of classification [48] as she experiments and adapts her drawings. She does demonstrate a strong perceptual bias towards established historical drawing techniques and formal design attributes in her representation of the butterfly and the eye, but it is accompanied by a process of visual editing and manipulation as she worked towards her goal 'to express the unique nature and vulnerability of each and everyone of us'.

Figure 3.
Aynsley artwork, butterfly eyes (2017), drawing.
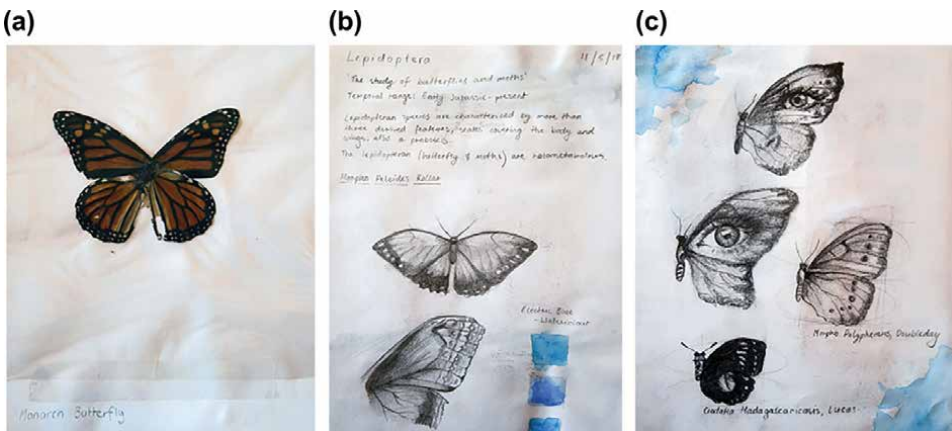
Figure 4.
Visual process learning An assemblage.

Her artified behaviours find her commencing her inquiry with a real photographic representation of the butterfly (a) she has selected to draw (b). Page 2 of **Figure 4** sees her create a descriptive illustration of the species following the formal humanist art traditions and using the scientific process of labelling or categorising. However, there is an emergent new space, a liminal space where there is the possibility of a re-classification as seen in the image on the right (c) of **Figure 4** or a re-grounding of her subjectivity [57]. Aynsley speaks to the possible interpretive lenses of the viewers, some seeing an insect, others seeing a human. Aynsley, however, has created a new resemblance of difference, a possible de-centering of the traditional humanist-centred world. It speaks to a new generation of youth who are aware of the planet and species vulnerabilities and as such Aynsley's transdisciplinary study may speak to the 'disidentification from established patterns of thought (which) is crucial for an ethics and politics of inquiry that demands respect for the complexities of the real-life world we are living in' ([57], p. 16).

3.1.2 Charlotte

Charlotte, like Aynsley, embeds artified visual representation behaviours that could be seen as informed by both algorithmic representations, brain scans, and mixed media conceptualisations in her installation. Reading from left to right of her installation in **Figure 5** we see the set of three painted artworks that illustrate stages of imbalance or disease states in the human brain. The inquiry is related to psychological and emotional well-being from a healthy brain towards a brain in an imbalance, the result of neglect. In front of her paintings are three plinths with a plant pot on top. Each pot carries a resemblance of brain neglect through the analogy of plant growth. Charlotte literally speaks to her performance of neglect in her artist statement.

Figure 5.
Memory, Cortical, Brain. Art installation comprising three mixed media ink and printed drawings accompanied by three plants in pots (Charlotte, 2017).

> *My aim was to look at the effects of neglect on brain development... examples of brain scans... The first brain is healthy, the second brain has experienced mild neglect and the last brain has experienced extreme neglect. The red represents the most active areas of the brain and the black represents the least active areas of the brain with yellow, green and purple in-between.*
>
> *The sprouts represent each brain. I treated the first sprout the best. I placed it in an area with the perfect amount of sunlight, I watered it when needed and placed the seeds in the best soil.... The last sprout was extremely neglected. I watered it only a couple of times, I didn't place it in the sun, and I placed the seeds in the worst soil. (Artist's Statement, 2018)*

In **Figure 6**, two pages from Charlotte's visual diary are displayed. She draws heavily from the scientific epistemic insights and the comparative study of each brain state.

It contains a strong observational focus with an effective and personalised perspective as she considers the implications of neglect on the individual and society. In addition, you can see her actively bringing together scientific emergent evidence, concepts, and visual communicative ideas. At the interview Charlotte revealed that loved ones surrounding her worked as mental health professionals, so she was both aware of mental health issues and the social consequences of neglect.

Being a critical self-reflective visual art student requires that one writes about one's artmaking in process, critically reflects on both one's intentionality and the emergent artwork. This is a continuous process as concepts emerge in progress and must be constantly re-assessed for their potential interpretive outcomes such as those formulated in an artist statement that is specifically for an audience. In the fine art course studied by both Aynsley and Charlotte these material artefacts are measures of the summative assessment course components. So, it was gratifying to be able to see audience statements that confirmed the scientific, social, conceptual, and communicative goals of Charlotte:

> *The effects of neglect on the brain – Charlotte: I like the contrast between the paintings themselves and the paintings and sprouts to illustrate the impact of neglect on the brain. I think the artwork very successfully conveys its theme and purpose (Audience survey, 2018).*

Making artworks, describing processes and practices, engaging in critical self-reflective acts through performative subject/object engagements are core in visual art education pedagogies.

There are similarities and differences between both Aynsley and Charlotte's artworks. Both appear to have started from the position of a school taught deductive scientific investigative approach, gathering facts and visual evidence surrounding their inquiry towards a reasoned and logical conclusion. In Charlotte's research, she goes directly to algorithmic digital evidence and uses accessible scans of the brain as her starting point as she seeks evidence of brain deterioration related to psychological states in humans. Of course, there are limitations or conditions to the validity of her accessed images [60], given that they may have already gone through an artification process prior to accessibility via the web. However, the images are sufficient to allow Charlotte to commence her thinking as an experiment. Aynsley commences her
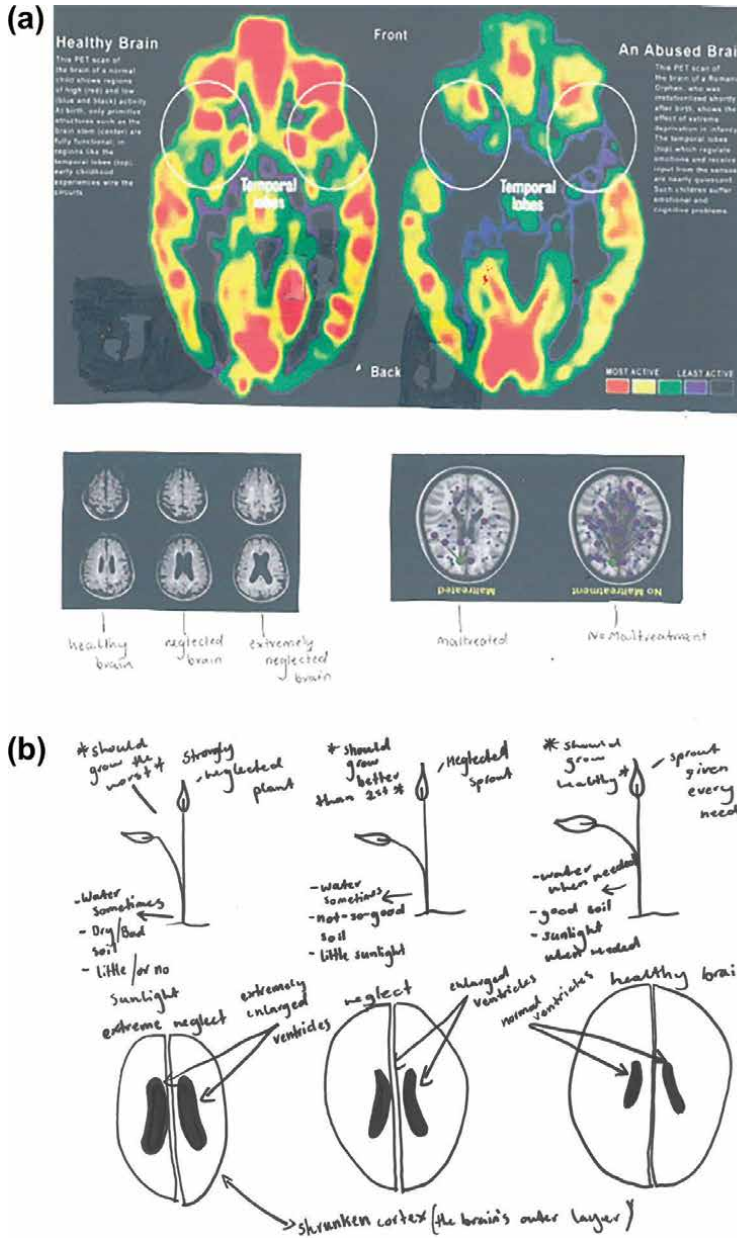
Figure 6.
Visual process learning diary page entries.

investigation through the processes of image development and refinement in line with non-algorithmic methods, such as scientific illustration. Aynsley performs her own perceptual and sensory artification when drawing her butterfly. From the outset, her research is a process of knowing-in-being [24]. Both the investigative processual approaches of Charlotte and Aynsley bring into play the need to understand that a more nuanced conceptualisation and empirical operationalisation of materiality in communication, learning, and education needs to be considered.

4. Discussion: transdisciplinary artification in visual borderlands

This section is a discussion about the students learning gathered from 2015 to 2019. All student learning was seen to embody a crossing of the borders between their scientific and artful inquiry lenses. Their artworks can be described as, being visual borderlands, occupied by signs from across our socio-semiotic world. In these spaces, the signs from different epistemologies intersect or intertwine as the students make links from their different lifeworlds. From informal learning to their school formal learning, they draw on personal experiences and the vast world of digital media. This has been a key finding of the longitudinal inquiry and audience responses to each exhibition, all spoke to being able to see both art and science learning. In this chapter, one of the key research findings is that artified visual pedagogies can both transverse and/or facilitate meaning-making across art-science spaces. Visual borderlands are the spaces occupied by the adaptive process of artification. Artification enables the students to embed the traditional humanist world of perception, observation, and illustration with the contemporary algorithmic world of curated digital scientific images. Both can be combined via different pedagogical practices from different subject fields, and as they combine, new ways of thinking and doing emerge to answer real-world inquiry questions.

These key findings are exemplified through the artefactual evidence of both Aynsley and Charlotte. It presents the concept of transdisciplinary visual borderlands learning, and it is argued that the examples presented in this chapter are evidence of how artification processes fit within a transdisciplinary learning construct. A construct where students apply two or more knowledge and skill areas to support their inquiry. The learning experiences have been interpreted by the researcher as being spaces that extend the experience to an encounter with being as becoming, to self as 'different social formations through very different assemblages, both artistic and scientific. This can be understood as knowing-in-being when learning in a transdisciplinary space. All learning carries transformational potential that is deeply embedded in the personal and 'consists in genuine learning from signs in the folding experience' ([61], p. 116). It entails folding acts that for Aynsley commence from the inside as embodied or dependent of percepts and affects [17] which are then folded with scientific understandings from the outside. Charlotte commenced from events in the personal, but her learning as an experiment commenced through the gathering of outward or scientific evidence which she subsequently folded on the inside in the formation of her own concepts grounded in her unique lifeworld experiences. The learning journeys of both are made up of expressive and shifting knowledge relationships. It is possible to see how both Charlotte and Aynsley take on ideas about the world and humanity and fold them deeply into their own sense of self; beyond being a visual art student to the consideration of a science-linked identity [10].

The learning artefacts of Aynsley and Charlotte are entwined with both traditional dichotomies of art/science, nature/culture, natural/artificial, incorporeality/materiality, subjectivity/objectivity, sense/effect, or body/thought and all collide in the performing of their unique learning. Importantly, all of these dichotomies can potentially disassemble and realign, as they intersect and intertwine as a new learning assemblage. Within an arts-based research paradigm, Aynsley and Charlotte were permitted to re-imagine how to learn, to de-territorise the art-science dichotomy. It is not as a crossing over from art to science or vice versa, but an opening up of liminal border assemblages full of possibilities. Indeed, no

science was taught at all by the fine art lecturer with an assessment brief to consider only the development of visual artmaking skills and the clarity of the student conceptual visual communication. This left any scientific inquiry to be driven by the student's past learning about reasoning in and through scientific imaging acts and they were free to imagine any assemblage of a combination of sign systems that best communicated their learning and ideas to an audience. Indeed, some students who had traditionally rejected the sciences were surprised by how much science they had actually learnt.

Beyond the key finding, that contemporary transdisciplinary art-science learning occurs at visual borderlands that facilitate the adaptive process of artification was the identification within the research that:

Science communication is now a significant field of research for science educators and that the artistic visual skills it embeds need to be considered by teachers when requiring students to represent their learning in the digital age.

Ways of knowing in science education must address the communicative goals of scientific images and teach students that all images are created for a particular audience. In so doing they teach students that the world of scientific images is indeed open to interpretation.

Learning emergent in visual borderlands is made up of different assemblages with a range of concepts and forms, dependent on the life world and perceptual focus of the student. The world of signs occupies these spaces and all images within this space are fluid. Each observer (student or teacher) will find new and unique connections or interpretations when they encounter the signs generated in learning.

Artification occurs in-knowledge generation and transversely operates across the visual borderlands of transdisciplinary knowledge. This is true for both visual sociocultural communication as it is for scientific communication.

Transdisciplinary learning is a place where the semiotic and cognitive work of image construction is now centred. Transdisciplinary learning disassembles epistemic boundaries or de-territorises knowledge and allows the imagination to enter all reasoning as science education is increasingly transformed by artified scientific media communication. This argument does not diminish the significant fundamental knowledge learnt within visual art education. Visual art education is a unique form of material knowing and communication. Its contemporary pedagogies reside within a post-structural understanding of knowledge construction offering insights into how the imagination and material knowing are active in personal meaning-making.

Science educators must now engage with the idea that visual reasoning as performative action is now the connecting pedagogy in all epistemic fields. The phenomena of fluid and online visual media communicative practices in youth today should be triggering for educationalists in these COVID times that the new consumption rituals for learning are being re-shaped by multiple manipulations and applications of imaged technologies. The visual habits of knowledge acquisition and production for concepts and communication increasingly contain unique perceptions, affectively, aesthetically, and spontaneously communicated as imaging actions. Art is now being presented as not subject to epistemological boundaries but requiring an expanded ontology [25]. The challenge that now faces teachers wishing to pursue transdisciplinary learning in their schools is that the world of assessment still essentially resides in an outcomes-driven curriculum, which embeds goal-centred planning, normalized images, and text-dominated assessment in the curriculum. This is a focus of future research with teachers.

5. Final considerations

This chapter argues that visual reasoning (both material and digital) as performative action is now the connecting pedagogy in all epistemic fields. Its artified visual pedagogies can both transverse and/or facilitate meaning-making across art-science visual material and media borderlands in the creation of transdisciplinary 'science-linked identities' [10]. Science educators must now engage with the idea that current education dogma and policy gives significant value to vocational and science, technology, engineering, and mathematics (STEM) education over the significant contribution of the arts and all their expressive and communicative forms. Its policy rhetoric speaks to creativity and transdisciplinary futures without acknowledging the non-linear, non-hierarchical, unstable, shifting, and mobile ways knowledge emerges today within both contemporary visual communication and science education.

There is a new science communication project being driven out by a recognition of the multiple lenses through which scientific images are created, interpreted, and communicated across expanding audiences and into popular digital media. Science learning requires a shift away from the objectivist learning position to a space that reconnects the world of signs beyond disciplinary boundaries [61]. This is also true of discipline boundaries within science education. It is images that infiltrate all epistemic fields of knowledge, and the work of images is capable of making the connections across and towards new knowledge constructs. The art-science inquiry on how gifted visualisers encountered and communicated their learning cross semiotic epistemological boundaries in this chapter demonstrates student capacities to use the world of images and be imaginative knowledge generators. Awareness of the complexity of images and their role in learning, assessment, and communication in science now speaks to the skill of visual performative competency where students are scientific, critical, and imaginative thinkers and communicators.

Author details

Kathryn Grushka
The University of Newcastle, Callaghan, Australia

*Address all correspondence to: kathryn.grushka@newcastle.edu.au

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Classroom as Complex Adaptive System and the Emergence of Learning

Ben Knight

Abstract

Complex adaptive systems (CAS) theory is offering new perspectives on the nature of learning in school classrooms. In CAS such as social networks, city traffic systems and insect colonies, innovation, and change are occasioned through non-linear, bottom-up emergence rather than linear, top-down control. There is a growing body of evidence and discourse suggesting that learning in school classrooms, particularly in the early years and primary phases, has non-linear, emergent qualities and that teachers, school leaders, and educational researchers can gain valuable insights about the nature of interactive group learning by analyzing classrooms through a CAS lens. This chapter discusses the usefulness of a CAS framing for conceptualizing learning in primary school classrooms. It will explore key arguments, discuss relevant objections and draw on my own research to make the case for a measured application of CAS theory to primary classroom teaching and learning, explaining how it can support the development of innovative pedagogies.

Keywords: complexity theory, complex adaptive systems, emergence, teaching & learning

1. Introduction

In this chapter, I discuss primary classroom pedagogy and assert that common portrayals of teaching and learning, particularly in media, policy, and some academic discourse, fall well short of capturing the complexity of what goes on in many classrooms. Traditional depictions of learning as linear, mechanistic, and in direct causal connection to teaching "input" remain dominant across education sectors, despite their failure to explain the unpredictable and uneven topography of pupil learning outcomes. Against this background, I argue that complex adaptive systems (CAS) theory may offer a useful non-linear alternative to the dominant linear, mechanistic thinking which dominates in many conceptions of school learning. In Section 2, I present the challenges and consequences of oversimplified conceptions of teaching and learning. In Section 3, I explain CAS theory and associated ideas in the context of education and explore arguments for and against applications of CAS thinking to classroom learning. In Section 4, I explore some pedagogical implications of conceptualizing classrooms and classroom learning through a CAS lens and discuss what these might mean for teachers.

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2. The over-simplification of classroom teaching and learning

There is widespread support in the literature for the view that primary classroom learning and teaching are not straightforward processes. Davis and Sumara [1] note that most teachers will attest to the unpredictability of learners' responses to teaching. Eisner [2] described teaching as "an inordinately complex affair" and others, [3–5] have framed teachers' roles in terms of managing uncertainty and problematizing unpredictability. Shulman [6] is unequivocal in describing teaching as "perhaps the most complex, most challenging, and most demanding, subtle, nuanced and frightening activity that our species ever invented". Descriptions of the facilitation and elicitation of learning by teachers themselves [7, 8] also acknowledge the unpredictable, dynamic and often messy, uneven nature of learning, and Alexander et al. sum up the argument with the assertion that "one cannot begin to understand the true nature of human learning without embracing its interactional complexity [9]." The case for learning and teaching being far from straightforward is also captured succinctly by Schon, who described teachers' work as operating in the "swampy lowlands" of everyday life. For him, "the problems of real-world practice do not present themselves to practitioners as well-formed structures. Indeed, they tend not to present themselves as problems at all but as messy indeterminate situations [10]." Considering this, it seems reasonable to suggest that what pupils learn in the context of school classrooms does not flow mechanistically from teachers' input and is not entirely within the conscious control of either teachers or pupils. This is not to argue that learning is not a function of teaching, but that pupil learning must be driven by more than merely the influence of teachers and teaching. It seems reasonable to hypothesize that teaching input is filtered through a range of networked factors resulting in learning occurring sometimes because of, sometimes despite, and sometimes irrespective of what teachers do.

Notwithstanding these depictions of the complex nature of learning and teaching, including from teachers themselves, a popular portrayal in policy and public discourse runs counter to this, presenting teaching and learning as simple, linear, causal, and mechanistic activities [11] reflecting a technical rationalist view of the profession [12, 13]. In this conception, teachers simply apply instrumental "teaching" solutions to address well-formed "learning" problems. Discourse and national agendas concerning teaching, learning, pupil progress, curriculum, standards, and teacher professional development are typically driven by this input-output conception. In the dominant policy discourse, "outstanding" teaching is often narrowly defined as the meticulous planning of lessons to meet specific, predetermined objectives [14] and despite years of reform in the UK and comparable education systems, the language of policy [15] still partially depicts a transmission and absorption notion of teaching and learning. This leads to the popular notion that if teaching is "outstanding" learning will (or should) be too. Tessellating policies of national testing, league tables, school inspection, and teacher competency descriptors firmly position teachers as the lynchpins [16] of pupil progress with the consequence that they are routinely held accountable for a phenomenon (learning) which appears to be only partially within their control.

This technical rationalist positioning of teaching alludes to an absorption and output conception of learning and learners. However, the pupil end of any learning and teaching relationship is no less complex than the teaching end. In any given school classroom "the persistence of inequities in student achievement [17]" speaks to a range of factors influencing learning. These include inherited and environmental

predispositions such as cognitive ability, personality, confidence, task commitment, and risk-taking tendencies along with influences from home and school ecosystems. More ephemeral factors influencing volition such as social dynamics, nutrition, mood, and even weather may also play a part. Research from several paradigms offers insights into learner factors and their effects on learning outcomes. Bronfenbrenner's [18] Ecological systems theory, for example, presents a framework for describing community and environmental influences on individuals. According to the model, interaction with other individuals and institutions across five levels of systems (from micro to chrono) shapes the individual's growth, learning, and development. These include family, peer group, school, media, and health care policies for example. Research into the emergence of gifts and talents in school-age learners [19, 20] has highlighted common elements, which typically correlate with high performance, including general cognitive ability, environment, personality, self-confidence, and chance. Numerous studies from the field of psychology [21–24] illustrate how personality influences readiness to learn and learning outcomes. Common findings suggest that the long-established "Big Five" personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism) interact in statistically significant ways with learning. Studies of class emotion and mood [25–27] reveal how pupil interactions, on/off-task behaviors, and learning can be influenced by interpersonal features including regulation, negotiation, and resistance. Despite wide-ranging acknowledgment across multiple disciplines that learning is influenced by a complex array of converging and mutually interacting factors (those mentioned above and many not mentioned e.g. working memory, self-efficacy, parents' education, personal health, and cultural expectations to name a few), its depiction remains largely characterized in public discourse by the receiving and remembering of information and the mastery of a set of skills. This is evidenced most clearly in the way that policy developments in the United Kingdom, and comparable education systems, over the last 20 years have striven to routinize teaching.

It is against this landscape, in which teaching and learning are characterized quite differently in policy and media to how teachers and pupils experience them, and how research frames them, that this discussion chapter sits. I have previously suggested [28] there is a need for more accurate depictions of teachers' work and its relationship to pupils' learning. As Hardman [29] points out, there has been a failure of simple causal explanations to adequately account for the complexities of school and classroom learning, because, according to Davis & Sumara learning tends to "defy simplistic analyses and cause-effect explanations [1]". Complex adaptive systems (CAS) theories may offer valuable insights about ways that learning emerges in classrooms and my hope is that advancing this discussion will contribute to unpicking current over-simplified thinking about teaching and learning and offer new perspectives on pedagogy.

3. Complex adaptive system (CAS) thinking

A less reductionist, less mechanistic, more accurate depiction of classroom teaching and learning will necessarily acknowledge their complexity. The framework of complexity theory (an umbrella term applied to the analysis of a range of dynamic, non-linear systems) is a transdisciplinary theoretical framework presenting a non-linear, non-mechanistic scheme through which to view change within systems. Emerging originally from disciplines such as computer science, cybernetics, chaos

theory, and the natural sciences [30–32], complexity theory has been applied to the natural sciences since the 1950s, and to the social sciences for approximately the last 30 years, as a tool for understanding systems containing multiple agents (in the case of classrooms: pupils, teachers, ideas, environment) whose adaptation, development or change (classroom system learning) is resistant to explanation using the traditional scientific method, or as Newell puts it, "phenomena resistant to reductionist analysis [33]." Complexity theory breaks with linear, causal, or deterministic explanatory frameworks [34], rejecting a version of reality in which "a knowledge of inputs is adequate to predict outputs [1]". Complexity theory distinguishes between systems that are merely complicated and systems that are complex. Complicated systems, such as clocks or engines, have many moving, interacting parts that behave in centralized, repetitive, predictable ways. They remain consistent over time. In contrast, complex systems display less predictable, bottom-up, emergent, and non-linear behaviors, because the elements constantly and mutually affect one another [35]. Central to the behavior of complex systems (and therefore to this discussion) are the concepts of self-organization and emergence. Complex systems are said to have self-organizing properties, meaning that they are not centrally governed or controlled, instead of individual agents in the system act with degrees of autonomy, through local decision-making. From these autonomous actions patterns of coherent, aggregate behaviors form across the system from the bottom-up; this is referred to as emergence. My contention in this chapter is that to some extent learning can be said to have emergent qualities and that complexity may provide a framework for depicting and explaining elements of classroom learning which are routinely omitted by mechanistic portrayals of classroom teaching and learning.

Complexity theory has been employed as a lens through which to analyze systems in and of education for a little under three decades now exploring a range of aspects including curriculum [36–39], educational research [1, 40–42], purposes of schooling [43], educational change [44, 45] and the philosophy of education [46]. A limited range of empirical studies have been undertaken into areas including school inter-ventions [47], non-linear modeling for education systems [48, 49], and agent-based studies at system, school and classroom levels [50–52]. Since complexity theory is still a novel framework in education, support for the application of a complexity lens to classroom learning is currently limited but growing. A number of studies have examined classrooms, focusing on links between classroom systems and complexity characteristics, analoging pupil interactivity with the non-linear, ensemble agent behavior characteristic of complex systems. My justification for framing the primary classroom as complex draws on these accounts which suggest that complexity has useful applications in the analysis of classrooms and classroom learning.

Systems that adapt themselves through complex emergence are described as com-plex adaptive systems (CAS). Typical examples from the natural sciences include ant colonies, insect swarms, or clouds, and city traffic is an example often cited from the human social sciences. In each case, patterns of complex aggregate behaviors emerge through the mutually self-interested actions of individual agents following simple rules. The system "learns" and adapts itself through the network of agent interactions without top-down control from any central authority. CAS is said to function more bottom-up than top-down. Whilst descriptions of CAS properties in the literature across multiple domains overlap considerably, the lack of any unified CAS field of study, a single body of literature, or agreed nomenclature has proved an impediment to achieving a universally applicable framing in the social sciences. As Sullivan points out, "it seems every theorist has his or her own list of characteristics, qualifying

properties, or optimal conditions for complex adaptive systems, each slightly different from the next [53]". Some have attempted to consolidate divergent definitions into more generalizable interpretations for CAS [53–58], however, even in synthesized forms, there is a considerable divergence from one framing to the next. Some theorists [1, 29, 33, 40, 44, 46, 53, 59, 60] have drawn on framings from complexity sciences to describe and discuss features of CAS in the field of education, though here too, no consensus exists about how to frame CAS.

The question of whether a school classroom is a CAS has been studied and discussed by some [29, 53, 59] including me [61] with mixed, but indefinite, conclusions, which depend largely on the CAS definition used and the organizing principles at work in the classroom. I have previously acknowledged [61, 62] that a primary classroom is not a CAS as originally conceived in the natural or computational sciences. However, along with others, I maintain that classrooms have sufficient CAS-like characteristics to warrant using a CAS framing to seek otherwise tacit insights about the nature of classroom learning. The most significant voices concerned with CAS thinking and education (Davis [1, 63, 64], Sumara [1], Mason [44, 45], Morrison [46], Sullivan [53] to name some) agree that caution should be exercised when attempting to conceive of the school classroom as a CAS, or equating emergence with learning. Analogies were taken from complexity science on radically emergent systems, for example, insect swarms, suggests that a classroom organized along similar principles would maximize knowledge sharing between pupils, have little by way of top-down leadership, prioritize individual self-interest and investigate questions to which neither pupils nor teachers know the answer. This is contrary to how most classrooms operate, whereby teachers exercise central executive control, pupil to pupil knowledge sharing may be considered cheating and the teacher tends to know "the answer". Whilst complexity offers "intriguing and generative metaphor(s)" for the classroom system [33], there are obvious limitations to such analogies. Despite some reservations, however, there is agreement among those who have examined learning through a complexity lens (Davis [1, 63, 64], Newell [33], Sullivan [53], Hardman [29] in particular) that instruction alone does not cause learning and that there are, as yet unearthed insights about learning which a CAS framing may elicit.

Whilst no two definitions of CAS in the literature align exactly, there are certain characteristics I deem to be most relevant to school classrooms that appear repeatedly in CAS definitions, shown in **Table 1**. These form the core framework for this discussion of emergent learning. Based on these criteria, a complex adaptive classroom system is one containing multiple autonomous, interacting pupils, whose inter-relationships create networked, self-organized, non-linear behaviors from which change (learning) emerges at different levels (individual, small groups, whole class).

3.1 The idea of a complex adaptive classroom

Complexivist educational researchers have explored ways in which characteristics of school classrooms overlap with descriptions of CAS, pointing out strengths and weaknesses in the comparison. Burns and Knox [65] compared De Bot et al.'s [66] descriptions of the development of complex systems over time, with their own analysis of classrooms. They found a number of correlations, including that both consists of sets of interacting variables (pupils, teachers, resources, environment), both had unpredictable outcomes (learning outcomes, critical incidents), both are part of and connected to other systems (family, institutional, community), both are sensitive to initial conditions, meaning that small changes or incidents can result in

CAS criteria	Definition
Self-organization	Individual agents acting with sufficient autonomy to determine their own actions/interactions/behaviors
• Pupil autonomy	
• Well-networked interactions	
• Local decision-making	
• Impulsive/instinctive behaviors	
Emergence	Organized patterns of synergistic behaviors which aggregate bottom-up across the system as a result of agent self-organization
• Bottom-up behaviors	
• Bifurcations	
• Perturbations/injection of novelty	
• Unpredictability	
• Evidence of non-additive learning	
Non-linearity	Information moves between agents via feedback loops and signals, therefore causality is not linear but networked and recursive
• Causation networked	
• Information moves back and forth between pupils	
• Pupils send and receive signals	
Transcend their components	Exhibit properties not manifest in individual agents; systems that learn; learning is more than the sum of the system parts
• Produce learning beyond the knowledge/ capabilities of each individual.	

Table 1.
CAS characteristics salient to classrooms and classroom learning.

large differences over time and both develop through interaction and through internal self-organization. These qualities produce the inherent instability which predisposes classroom systems to emergent change over time. Davis and Sumara [1] posit that to really understand the dynamics of the classroom it is necessary to stop thinking linearly, a point which is supported and explained, with reference to how the social world behaves, by Byrne [67] who asserts that outcomes are determined by multiple causes moving in non-linear ways. Typical classroom examples of this are the multiple factors that might determine whether a pupil contributes verbally or not to a class discussion. These might include (though are not limited to) peer pressure, personal ambition, knowledge of an answer, fear of failure, confidence level, social status, degree of interest, or desire to go to lunch. If the classroom is a CAS, one would also expect these factors to interact with one another and exert influence over other pupils indirectly ("if my neighbor keeps quiet I will speak up/keep quiet; if my neighbor speaks up I will compete to speak first/keep quiet") making causality non-linear, an argument which most teachers would not find it difficult to make. The point here is that classrooms consist of more than simply 30 separate linear interactions between teachers and pupils. Pupils influence one another in multiple visible and invisible ways making it difficult to trace the antecedent(s) of any given event or outcome.

Arguing that classrooms display CAS behaviors, Guanglu [68] points to the non-linear, recursive nature of teaching and learning, in which pupils' and teachers' interconnections produce continuous recursions of understanding, interpretation, re-understanding, and reinterpretation. Teaching and learning do not always follow

this pattern, in fact, the linear transmission of information remains common in many classrooms and arguments for more direct instruction are currently strengthening [69–71]. However, some degree of openness and randomness are characteristic of even in the most tightly controlled classrooms and at times learning can take on forms more akin to "mutual fertilization, pollination [and] active catalytic(s) [38]". Guanglu suggests that this mutuality is seen in the experience, commonly reported by teachers, of gaining a new or better understanding of the subject matter they are teaching, through the act of teaching it [68]. Support for conceptualizing school classrooms as CAS also comes from Hardman [29] who asserts that sudden or unanticipated emergence of novel outputs in classroom activity is inevitable, partly due to the internal diversity of classrooms, including the uniqueness of individual pupils' (and teachers') brains. Novelties might include sudden realizations, moments of inspiration, original ideas or solutions derived from collaborative experimentation. Diversity is a theme which Davis and Sumara [1] pick up. They suggest that differences, counterpoints, and asymmetries between agents within a system cause the very perturbations from which self-organization and emergence originate. Diversity in this sense does not refer to demographic identity differences (race, gender, etc), but to the myriad tangible, intangible, perceptible, and imperceptible differences which exist between human beings which in the classroom may cause differences in perspective, motivation, intent, action or utterance. These might include, personality traits, personal histories, family environment, inherited traits, self-esteem, self-confidence, or mood. In a CAS, internal diversity is one factor that helps maintain a system's vibrancy and promote adaptation, keeping it far from equilibrium. In the context of a primary classroom this is seen in the way that given sufficient autonomy, pupil interactions rarely follow prescribed pathways or result in predictable outcomes. Collisions between individual diversities create collisions between ideas and perspectives which in turn creates the pluriform, entangled messiness so evident to teachers. From the mess, however, novelty and innovation often emerge.

A few suggestions are evident in these descriptions which lend support to the framing of classrooms as CAS. Firstly, that classrooms, like other CAS, have many moving parts which, given sufficient opportunity to interact, will produce productive instability. Secondly, that instability is causally connected to learning insomuch as randomness changes interactive behaviors and injects novelty, which can qualitatively change learning states. Thirdly, there is an implication that even in classrooms characterized by linear transmission and high degrees of centralized teacher control, openness is inevitable to some degree. Described in these accounts of classrooms and adding some legitimacy to comparisons with descriptions of CAS, are factors beyond, or resistant to, control. Despite the structure of organized schooling, the structure of the curriculum, and the necessary order imposed by teachers, diversities reveal themselves when pupils enjoy sufficient autonomy and openness in the classroom system and this creates opportunities for unpredictability and non-linear change. An example of non-linear emergent learning is evident in the common understanding that alongside the top-down influence of the teacher, pupils also influence and change one another through mutual self-influence [63]. The flow of content, explanation, and questioning does not only travel unidirectionally from teacher to pupils and result in the development of neat predictable knowledge, understanding, and skills. Alexander et al. point out that "change that happens in the learner, be it dramatic or imperceptible, or immediate, or gradual exerts a reciprocal effect on the learner's surroundings [9]". This depiction offers a strong positive comparison between classrooms and CAS, implying that there is also a flow of information and influence

between pupils, towards the classroom environment and climate and, presumably, back towards the teacher as well. This suggests that as pupils change, they also change one another, the teacher and their surroundings, including the environment, through their mutual interconnectedness, much like the behavior of a CAS. Davis and Sumara refer to this phenomenon when stating that complex systems, such as classrooms, are systems that learn. Within such systems, they suggest

> *"one cannot reliably predict how a student or a classroom collective will act based on responses in an earlier lesson, or sometimes a few minutes previous. In other words, strict predictability and reliability of results are unreasonable criteria when dealing with systems that learn." [1]*

This means that in a classroom, change (learning) is unlikely to only unfold entirely as intended or directed by the structures of organized schooling, the curriculum, or the teacher. The system and its constituent agents will also adapt and change in ways not predicted or intended by those governing structures. This is evident in the common occurrence of classroom ethos, culture, and atmosphere changing over the course of a week, month, term, semester, or academic year. Such changes are behavioral, relational, environmental, and knowledge-based and can be felt by pupils and teachers in the dynamics of the classroom system. The system adapts because the collective adapts. Groups adapt because individuals adapt. Haggis suggests that emergence is always unpredictable to some extent, stating that "what emerges will depend on what interacts, which is at least partly determined by chance encounters and changes in environments [41]." This supports Biesta's point [72] that learning cannot be reliably predicted but is a retrospective judgment. A principal learning characteristic of classrooms according to complexivists is their tendency towards self-organization and self-maintenance, what Sullivan [53] refers to as "adapt[ing] of their own accord." Some degree of self-organization is inevitable in any system which is not entirely mechanistic and deterministic and since wholly determining the opinions, predilections, desires, impulses, thoughts, and behaviors of groups of pupils is impossible (not to mention undesirable), the tendency for self-organization to exert an influence on classrooms is understandable.

3.2 CAS classroom framing: Some cautions and discussions

It is necessary to ask, however, to what extent this phenomenon can be said to positively influence learning. In a CAS such as an ant colony, immune system, or decentralized finance block-chain, the self-organization and its concomitant adaptation is the learning. The fluctuation and interaction of many agents (be they ants or genes) all influencing one another, all influencing the system and being influenced by it, produces change that exceeds the individual possibilities of the agents. However, this analogy does not translate perfectly into school classrooms because, as Biesta [72] points out, education is not a morally neutral activity, but a purposeful, values-orientated one, and because of this, what is learned matters. He argues that describing learning as whatever emerges as a result of classroom interactions ignores the fact that education exists so that people learn something, not just anything. This argument fits with assertions from others [42, 73] that a CAS framework has considerable limitations when analyzing classroom learning because classroom learning is goal-orientated and has prescribed directions in which teachers must steer all pupils. As Kuhn puts it

> *"It may be argued that there is a fundamental mismatch between complexity and educational enterprise as in essence complexity is descriptive whereas education is normative, or goal-orientated. {...} complexity offers organizational principles for describing how the world and humans function. Education, however, is orientated towards achieving certain goals [42]."*

These descriptions of the purposes of education are demonstrably incompatible with depictions of CAS, in which higher complexities may emerge as a consequence of agents operating individually out of mutual self-interest. Kuhn goes on to state "complexity merely describes, whereas education aims to make a difference [42]". A consequence of this purposefulness that characterizes education (and which distinguishes it from learning in the general sense) is the centralized control of the teacher. Teachers impose expectations and structures on classroom activity and do so in the interest of curricular aims and purposes. Biesta [72] describes how this introduces "an asymmetrical element into the educational process" which is "one of the main reasons why educational learning is radically different from collective, interactive, explorative learning". Without the imposition of purposive structures, the likelihood of emergent learning aligning with curriculum aims is low and the risk that nothing of curricular value will be learned, potentially high. Individuals in a classroom system are not all equal and teachers do not permit pupils to behave out of self-interest, for good reason. Ramussen agrees that educational learning has "special intentions in mind" [74], describing teaching as a "social arrangement and organization aimed at intensifying possibilities for learning and the results of learning". The absence of any overarching "special intentions" in a CAS found in nature or in human systems at a great scale, such as cities or economies, weakens the case for classrooms being viewed as CAS. Sullivan's study [53] illustrates this. Examining three different lessons (a music class, a mathematics class, and an English class) through a CAS lens, he noted that not all the classrooms displayed complex adaptive behaviors. He suggests that a key factor in whether a classroom can usefully be classified as a CAS is whether adaptations within the system are triggered by the teacher or by the collective. If the teacher orchestrates all or most responses to daily events (snow days, timetable changes, pupil absence) with little involvement from the pupils, then adaptations cannot be described as bottom-up. In concluding he states

> *"One may say that classrooms are inevitably complicated, and I would certainly agree. One may even say that all classrooms exhibit some measure of complexity, and I might agree. To assume, however, that a class will network itself in such a way that it adapts in any meaningful way is too much to assume [53]."*

Radford [40] bridges arguments for and against comparisons between classrooms and CAS using a metaphoric continuum between what he refers to as "clockishness" and "cloudishness". He draws on Popper's assertion [75] that all systems can be viewed on a continuum between deterministic, reducible, and predictable (clockish) on one hand, and indeterminate, unpredictable, and open (cloudish) on the other. Radford's contention is that even the most deterministic systems, such as clocks, have degrees of unpredictability, and that likewise, the most open and unpredictable systems, such as clouds, have some degree of predictability. Viewed at sufficient resolution, a clock will reveal its lack of mechanistic causality and a cloud will reveal its causalities. All phenomena, according to Radford, can be thought of as having degrees of both "clockishness" and "cloudishness". The question is, which is the most useful or accurate explanatory framework for depicting a given system. Some researchers have attempted to describe

the "cloudish" features of classrooms and how exploring them might lead to new insights about classrooms and classroom teaching and learning. Semetsky for example presents a radical vision of a self-organized classroom, characterized by decentralized control, pupil autonomy, and an absence of direct instruction. She posits that this would "naturalize the concept of learning [76]" through the introduction of greater choice for pupils. She envisages a classroom in which there are no right or wrong responses or answers, just an array of choices for pupils, creating an environment with an "inherent incapacity for students to experience failure at any point within the process" because there is no "special educative aim". This vision of classroom learning is considerably more cloud-like than clock-like and would require a radical overhaul of curriculum structures, not to mention the very purposes of education. Semetsky acknowledges that this radical vision has the potential to be counter-productive, however. She draws on Cillier's warning about chaotic system behaviors or "catatonic shutdown [77]" and suggests that a multiplicity of pupil options may contribute to complete disorganization rather than self-organization. This is similar to Waldrup's assertion that whilst frozen (clockish) systems can benefit from "loosening up a bit", turbulent (cloudish) systems "can always do better by getting themselves a little more organized [78]".

Morrison presents a similar critique and asks

> *"whether self-organization is such a good thing, or whether it will lead to diversity, inefficiency, time-wasting, mob rule, and a risk of people going off in so many different directions that the necessary connectivity between parts of an organization, its values and direction will be lost or suffocated [46]."*

This is a valid question. Judging when sources of novelty and disruption risk undermining sources of coherence within a system is crucial to maintaining a productive edge of chaos states and is a crucial aspect of teacher professional judgment. In a CAS such equilibrium is maintained through self-organization. In a classroom, it is largely due to the influence of the teacher. A key illustration of why the conception of classrooms as CAS both is, and is not, accurate and useful.

Others present visions of classrooms as self-organizing adaptive systems, which are less adversarial to the purposes of education than Semetsky's. Fong for example, suggests that the concept of self-emergent order is well suited to early learning environments because of their natural tendency to balance the "dual worlds of emergent order and imposed control [79]" and the challenges teachers face in managing the latter in busy nursery or kindergarten classrooms. Sullivan [53] also takes a positive view of the classroom as a CAS and posits that in classrooms where the features of CAS such as self-organization, distributed control, and agent-interaction (the more cloudish characteristics) are maximized, novel learning emerges. Defining emergent learning as the "acquisition of new knowledge by an entire group when no individual member possessed it before [53]" Sullivan suggests that some curriculum subjects lend themselves more than others to the conditions in which such learning might emerge (literacy more so than mathematics in his example). One such feature of CAS which might be emphasized and capitalized upon in the interest of classroom learning is neighbor interactions. In their study of Canadian mathematics teachers Davis and Simmt noted that with sufficient density of short-range pupil interactions and networking, the emergence of novelty was likely. Their concept of neighbor interactions includes, but also stretches beyond, pupils sitting on the same table. They emphasize that "neighbors in a knowledge-producing community are not physical bodies or social groupings. Rather, the neighbors that must "bump" against one another are ideas [63]". They recommend

maximizing conditions in which pupils' ideas can collide, not just between neighbors on tables, but across the topography of the classroom system, because "agents within a complex system must be able to affect one another's activities [1]".

It is clear that school classrooms share several characteristics with CAS, however, the extent to which any classroom can usefully be described as complex depends on how it is organized. Classrooms that operate under strictly centralized control ("clockish") will share fewer features of CAS, whereas classrooms which function in more decentralized or distributed ways ("cloudish") are likely to create space for the sort of autonomy which invites more CAS-like behaviors. Under such organizational principles, pupils may interact in networked and non-linear ways, becoming self-organizing, and inviting learning to emerge bottom-up, rather than always traveling top-down from the teacher. **Figure 1** depicts three broad typical organizing principles
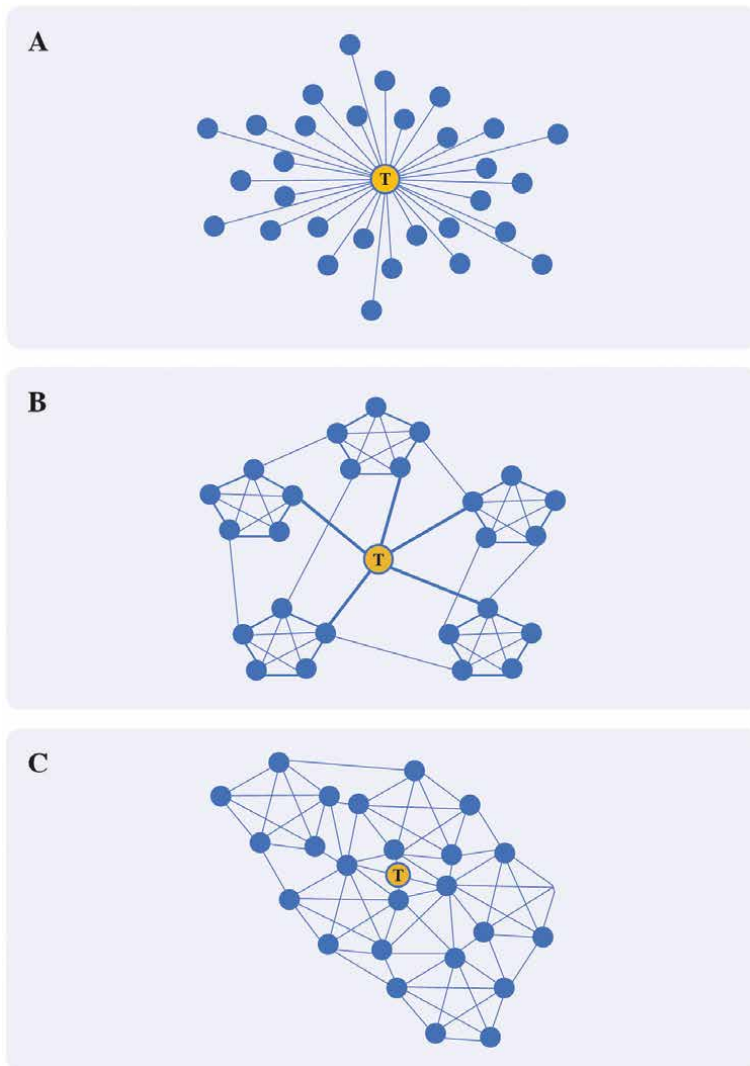

Figure 1.
Centralised [A], decentralized [B], and distributed [C] classroom organizing principles. Adapted from Davis and Sumara [1].

common to many classrooms: centralized, decentralized, and distributed. When centrally organized [A], communication flows linearly from the teacher to the pupils but there is little or no interaction between pupils. When organized in a distributed manner [B], groups of pupils interact, including with the teacher, however, there is little or no mutual interaction between pupil groups. In a more distributed organization [C], interactions occur between any individuals with no central organization from the teacher. Newell [33] points out that all three organizational principles may be enacted at different times in any given classroom (even within a single lesson). In classrooms where decentralized or distributed forms are common, ideas are more likely to collide, pupils are more likely to become mutually influential, novelty and innovation may be more apparent, and learning may emerge which exceeds what any individual pupil previously knew or understood.

However, as Semetsky [76] has noted and my own research [62] attests, events, occurrences, and interactions that challenge or obstruct learning are also more likely in decentralized and distributed classrooms structures. With greater pupil autonomy comes greater unpredictability, greater likelihood of social conflict, and greater unevenness in pupil participation. Many theorists [80–87] have also noted that pupil interaction alone rarely results in elaborated learning and that the organizing and structuring influence of the teacher is essential in transforming pupils' hunches and intuitions into knowledge and understanding. With this in mind, and notwithstanding the evident CAS-like qualities of classroom learning, it is relevant to ask what the potential pedagogical benefits of a CAS classroom framing might be.

4. Implications for teachers and teaching

Notwithstanding its limitations, there is sufficient merit in the arguments for CAS-classroom comparisons to conclude that viewing the classroom through a CAS lens can illuminate a range of teaching and learning behaviors that might otherwise go unnoticed, and therefore unattended to. Among the drawbacks to an over-simplified, linear view of teaching and learning mentioned in part one of this chapter, is the risk that despite knowing better, teachers may teach in ways that presume a linear relationship between teaching and learning, missing opportunities to set conditions conducive to non-linear emergence. A CAS lens may encourage teachers to think non-linearly about learning processes, to become more attuned to collective, networked effects on learning, to see the critical potential in moments they might otherwise ignore, dismiss or want to prevent, and gain a more thorough appreciation of why pupil learning does not appear to augment in a steady trajectory. Arguments have been made that the extent to which classrooms reflect CAS-like qualities depends on how they are organized. More centralized organizational structures are less likely to encourage self-organized behaviors, whereas decentralized or distributed structures are more conducive to self-organization and emergence. In this final section I argue that teachers can occasion emergence through the organizational principles they employ and the degrees of autonomy they give to pupils, in order to capitalize on useful CAS-like classroom characteristics in the interest of learning. Part four draws on preliminary findings from my own recent research into emergent learning in a British year 4 classroom to explore how this might be achieved and what the benefits might be.

4.1 Thinking non-linearly

Linear thinking tends to result in linear expectations, which for teachers means the assumption that tangible evidence of pupil learning will follow shortly after teaching input. This mechanistic reckoning about learning is a key part of the simplification problem presented at the start of this chapter and is ubiquitous in classrooms across the world. However, it does not reflect how many teachers experience classroom learning on a day-to-day basis. Thinking non-linearly about teaching and learning means understanding that learning is a consequence of multiple, networked factors which may not covary linearly or occur in the same moments or places. Learning, when it emerges tangibly, is the result of inputs from multiple sources, including direct teaching, autonomous activity, peer influence, social dynamics, personality traits, prior conceptions, understandings, misunderstandings, environment, and chance, from a range of temporally diverse events. In short, learning (including individual learning) results from system-wide factors, not simply the linear mechanisms of teaching. Instruction may be the dominant influence on pupil learning, but is far from the only influence and its effects are filtered through multiple influences both within, and outside of, the classroom system. Awareness of the networked and recursive nature of learning enables teachers to notice, attend to and even plan for the pluriform influences which may assert themselves in, and beyond, the classroom. For example, awareness that pupils' mental models, their understandings, and the connections they make are substantially influenced by experiences outside of school may lead a teacher to elicit information about pupils' wider experiences of a phenomenon before planning to teach it. Similarly, knowing that new knowledge may emerge through decentralized and distributed interactive structures may lead teachers to facilitate episodes of autonomous, or semi-autonomous group activity expecting pupils to create or evolve ideas which they themselves had not planned for. Thinking non-linearly can encourage teachers to not only ask conditional "if-then" questions about teaching and learning but also consider "what if ..." questions which can produce sensitivity to teachable moments. Thinking non-linearly changes expectations about how, when, and from where learning might emerge and can result in teachers noticing potential and future learning in its infancy. Sensitivity and responsiveness to "soon-to-be" learning as it appears are at the heart of effective pedagogy. Understanding that pupils, their ideas, utterances, moods, similarities, differences, and personal histories interact in non-linear ways can help teachers to look for potential learning in places and at times not typically explored when expectations follow singular, linear logic. This includes finding learning, or the conditions for learning in unlikely places, including classroom disruption, in social conflict, or in incidental, unintended moments.

Thinking non-linearly is not a typical habit for most teachers, however, trained as they often are to view teaching and learning in a unidirectional causal relationship in which learning is singularly the product of teaching. This is essentially the central presumption of the "what works" educational paradigm [88] and there are understandable justifications for this habit of mind; not least because it is accurate to some extent. Learning is a consequence of teaching. The problem is not that teaching has no part to play in learning, it plays a significant part, of course. The problem is the failure to understand teaching and learning as existing in a recursive, mutually influencing relationship and failure to see learning as an emergent phenomenon that surfaces because of bottom-up dynamics as much as from top-down instruction. Non-linear

thinking, which attempts to accommodate these concepts, will require some effortful reimagining on the part of teachers well-versed in the "what works" paradigm.

4.2 Attunement to networked influences on learning

Non-linear thinking about teaching and learning has the potential to unlock awareness of the different sources which influence learning and how they interact with one another. Once aware that instruction is only one of several influences and that the multiple influencing factors are mutually interactive, teachers may view common classroom scenarios and occurrences differently. For example, when pupils articulate their understanding of a concept or process it is likely that the new understanding was constructed in an uneven trajectory involving bursts, plateaus, and stops over time. In addition to teaching input, the conceptual understanding will be a result of their interactions with other pupils, the collision of ideas those interactions permit, interaction with the environment and with aspects of their own and others' personalities, learning habits, social status, intellectual and non-intellectual pre-requisites. Sensitivity to these factors can support teacher judgments about pupil grouping, sequencing, and duration of classroom activities, whether and when to intervene, scaffolding questions to ask, and the importance of helping pupils to link experiences. My research with 8 and 9-year-old pupils in a British Year 4 classroom [62] suggests that learning is always a process of organizing, reorganizing, constructing, reconstructing, and refining existing knowledge and understanding. This was illustrated in instances where pupil learning was the consequence of errors and misunderstandings, off-task as well as on-task behaviors, and because of, rather than in spite of, social conflict. There was also evidence that asymmetries in pupil social hierarchies produced discussion and knowledge sharing which more symmetrical dynamics almost certainly would not have. In one such example, the disruptive influence of one pupil in a practical small group activity and the frustration it caused other group members actually drove reconfigurations in pupil roles and articulation of perspectives, arguments, and explanations. The atmosphere was not calm and cooperative, but ideas, demonstrations, and later articulation of learning almost certainly resulted in part because of this. Behaviors which a teacher might instinctively want to prevent unlocked learning for some pupils, to some extent. Attunement to these factors and possibilities, particularly the knowledge that learning can emerge out of social conflict (which teachers routinely, and understandably, aim to suppress) has the potential to shift teachers away from expecting evidence of learning during or shortly after instruction, towards a more authentic appreciation of and attention to the range of antecedents, including unexpected ones.

4.3 The unexpected emergence of learning

Attunement to the CAS-like features of classrooms and non-linear thinking about learning processes opens the door for teachers to re-evaluate their intuitions about where and how learning can, or might, emerge. Acknowledging that some antecedents of visible learning originate from outside of the linear mechanisms of direct instruction means acknowledging that learning is caused and supported by more than simply teacher explanation and demonstration or planned classroom activities. It may also emerge incidentally during the non-lesson time or out of instances of social disruption, which teachers typically aim to discourage. Evidence from numerous classroom studies [89–93] suggests that when pupils collaborate autonomously, or

semi-autonomously, on shared activities some degree of social conflict is inevitable. This may range from minor disagreements about turn-taking or resources that do not interrupt the flow of activity, to larger arguments that disrupt purposeful activity, cooperation, and group productivity. What these studies do not acknowledge, however, is that whilst there are sound reasons to discourage an atmosphere of conflict in the classroom, clashes of personality, asymmetries of social dominance, disagreements about pupil roles, and the socially engendered necessity to resolve these can actually produce moments of novelty, innovation, knowledge sharing or motivation which lead to learning. It is no surprise that nowhere in the literature is there any support for the idea that social conflict might also support curriculum learning in unexpected ways, however, some of the data in my recent research [62] suggests that learning does not just survive episodes of social conflict, but can be occasioned by it. I am not here advocating a laissez-faire approach to classroom management or an "anything goes" attitude to pupil behaviors. Calmness, cooperation, and mutual respect are necessary and desirable qualities to encourage in classrooms. However, I am (somewhat tentatively) suggesting that when teachers suspend, even temporarily, their linear expectations about what produces learning (and perhaps even stop thinking about learning as a product altogether), they may notice teachable moments worth capitalizing upon in some unexpected places.

According to Davis and Simmt [63] the network of mutual self-influence between pupils, environment, and classroom climate, and the resulting randomness, opens the door to novel moments of teaching and learning. An example of this in my recent research included instances in which arguments between two pupils prompted periods of increased productivity and "on-task" behaviors from others. In another example the repeated ignoring of a low social status pupil by his small group caused him out of frustration to share his ideas with the teacher, resulting in him eventually explaining it to the whole class, whereafter most groups adopted his ideas. The learning in these incidents, or the conditions for it, emerged bottom-up rather than top-down. What emerged was a consequence of the situated, unique dynamic choreography of multiple pupils' wills, personalities, social standing, and knowledge states, among other factors. Sensitivity to the ways these and other factors can interact to produce conditions for learning where one might not expect to find it can be advantageous to teachers. How then might teachers use this knowledge and capitalize on it in the interest of learning? The knowledge that whilst excessive pupil autonomy, interactive license, or social conflict is likely to obstruct learning, appropriate degrees of freedom from centralized teacher control can invite novelty, could lead teachers to re-evaluate their centralizing instincts and look for a balance between Radford's "clockish" and "cloudish" organization [40] in their classrooms. Such re-evaluations can lead to teachers pausing, observing, and assessing for potential teachable moments. If there are potential benefits in allowing social conflict to play out, enabling pupils to find their own resolutions, this may lead teachers to re-assess how and when they intervene. Judging the line between tolerable and intolerable degrees of social conflict or noticing signs of potential learning benefits is unlikely to be easy, however there is evidence, albeit tentative, that there may be payoffs for teachers brave enough to try. The "edge of chaos" [1] will always be a double-edged sword, inviting innovation but also risking havoc. Semetsky [76] acknowledges that radical visions of open and unrestrained classroom systems, whilst opening doors to possibility, might also be counterproductive. Accepting that interactive learning is by nature open and generative (and therefore susceptible to disorganization), Biesta [72] has argued in favor of enabling constraints, structures which facilitate autonomous pupil interaction,

encourage novelty and originality but without courting havoc. A useful question for teachers therefore might be, how can I implement limits on interactive learning which unlock and enable, rather than dampen, novelty and originality?

4.4 Occasioning emergent learning

CAS-framed classroom research and discussion [33, 61, 62, 64] suggests that CAS-like behaviors do not necessarily occur naturally in all classrooms, but depend to a large extent on balance between sources of coherence and disruption; between centralized control and decentralized autonomy. Having looked at some of the opportunities which CAS-like behaviors might offer teachers and pupils in pursuit of learning, it is worth considering ways teachers might occasion emergence by locating and exploiting "sweet spots" between rigid order and all-out chaos; in which pupils benefit from what autonomous interaction and teacher scaffolding have to offer. This is what Radford [40] refers to when describing systems, which are a balance between "clockish" and "cloudish". This would include knowing how, and judging when, to centralize or decentralize the organization and autonomy, and understanding the consequences. Much like a jazz leader, knowing when to allow improvisation and when to return the ensemble to the main theme. "Sweet spots" exploit the most useful products of centralized, decentralized, and distributed classroom structures, whilst avoiding the unproductive excesses of each.

In tightly controlled, centralized classroom structures ideas tend to flow linearly from the teacher to the pupils and back from individual pupils towards the teacher. Under this organizing principle, ideas do not collide, they simply travel along straight lines, often in just one direction emanating from the teacher. Those ideas become known by everyone but are not interrogated, trialed, experienced, regurgitated, or challenged. The principal casualty of this tendency in highly centralized classrooms is the cross-fertilization of pupil perspectives and emergent learning. Newly emerging understandings, partially articulated thinking, and challenge to pupil assertions tend to arise more freely in distributed peer-to-peer interaction than in centralized, didactic scenarios. Too much centralized communication is likely to stifle this "soon-to-be" learning. At the opposite extreme, in classrooms principally characterized by distributed structure, ideas tend to collide but are rarely refined, sustained, or linked coherently. The main casualty here is the spread of ideas since ideas tend to remain local, petering out without dissemination, and coherence, because thinking remains atomized. Somewhere between these extremes lie sweet spots where pupils experience sufficient freedom and autonomy to encourage elements of self-organization and bottom-up novelty, accompanied by sufficient central teacher coordination for emerging ideas to be shared, digested, shaped, and sustained. Factors that teachers can manipulate to locate such sweet spots include (among other things) physical space, time periods, activity types, and groupings. Activities with sufficient openness undertaken for appropriate durations by autonomous or semi-autonomous pupil groupings with considered classroom organization and sensitive teacher intervention have the potential to create space for novelty, creativity, and innovation to emerge. Timely shifts between distributed, decentralized, and centralized structures may enable learning to emerge and progress from emergent states towards elaborated, more secure states from which it can be more easily redistributed.

In order to create conditions in which partially formed ideas may grow into articulated explanations or productive applications, a range of pedagogical prerequisites are necessary, beginning with an understanding of what centralized,

decentralized, and distributed modes of classroom organization offer the pursuit of learning. Confidence and competence in noticing signs that classroom structures need to be loosened or tightened follow logically from this, along with knowing how and judging when to do this. Creating open learning activities and opportunities that are fertile ground for ideas to collide, which are encouraging autonomous interaction and structured sufficiently to elicit novelty and originality, whilst avoiding excessive teacher control takes courage and practice. The starting point, surely, is sensitivity to potential teachable moments, attunement to the networked interacting influences at work in the classroom, and openness to the possibility of learning emerging from unexpected places.

5. Concluding thoughts

In response to the widespread tendency for teaching and learning to be depicted in over-simplified and linear-causal terms, this chapter has discussed the potential usefulness of applying a CAS framing to the primary classroom. I have sought to begin addressing the question of whether viewing classrooms as complex systems may illuminate inherent complexities of learning and ask whether doing so reveals any useful lessons for teachers. Descriptions of the behavior of CAS and consideration of the typical characteristics of many classrooms leave little doubt that classrooms have CAS-like features, though the extent to which such features may prevail in any given classroom depends to a large extent on how teaching and learning are organized. The most salient CAS qualities inherent to primary classrooms are occasioned by pupil autonomy, interconnectedness, and interaction through which there is some evidence that learning can reveal itself in emergent forms, more as a consequence of bottom-up than top-down initiative. Under the right conditions, including sufficient enabling constraints and pupil autonomy, a focus on CAS characteristics can draw teachers' attention to the possibility of learning emerging from unexpected sources and in unanticipated times and ways. These include pupil errors, social conflict, and apparently off-task behaviors. However, more research is needed into the forms and value of such emergent learning, including how and to what extent it can be encouraged by thoughtful, imaginative, and sensitive teaching.

A possible implication for teachers is a recommendation to introduce subtle shifts in thinking about classroom practice and pupil learning. This would include considering the potential benefits of loosening central control and allowing pupils sufficient autonomy for self-organization to materialize, holding less tightly to evidence of pupils meeting learning objectives in unitary packages, and developing sensitivity to what else might be learned, when and how. I would urge my fellow teachers away from framings that locate learning as merely the linear product of teaching and instead invite them to adopt a more open and speculative mindset, exploring and investigating pluriform and interconnected antecedents of learning, rather than expecting it to appear as a product following teacher input.

Author details

Ben Knight
University of the West of England, Bristol, UK

*Address all correspondence to: benjamin3.knight@uwe.ac.uk

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Section 3

Challenges and New Applications in High Schools, Vocational Learning and Higher Education

Exploring Problems Encountered by Six Indonesian Teachers in Teaching English: A Case Study in an EFL Context

Listyani Listyani

Abstract

It is known worldwide that according to Kachru, there are three circles of world Englishes. The first one is the inner circle, then the outer circle, and the last one is the expanding circle. The last one, the expanding circle refers to the countries where English is a foreign language, including Indonesia. People living in the expanding circle may not get as much exposure as the ones living in the inner or outer circles. They are not exposed to both the spoken and written language as much as those living in the previously mentioned circles. Language learners have to struggle in learning English. This paper describes the challenges and difficulties encountered by six EFL teachers in Indonesia. Two research questions guided this study: *What challenges are faced by six Indonesian teachers in teaching English?* And *what solutions do the teachers implement to solve the problems?* The six teachers were selected as respondents because they faced special challenges and difficulties in teaching their high school students. Data were collected through questionnaires distributed to the teachers and interviews done via Google Meet. The findings revealed that the problems the teachers faced varied from social, personal, psychological, as well as financial problems, which the language learners encountered.

Keywords: EFL, problems in teaching English, Indonesian students, case study

1. Introduction

People living in expanding-circle countries in which English is a foreign language really need to struggle to learn this international language [1]. There is not much exposure as what is found in the inner and outer circles. Although exposure these days comes to a large extent from written social media or news channels, still, it is not easy to interact with people daily in English. Communication with English-speaking counterparts often cannot be simply done. It is frequently difficult to find counterparts to practice the spoken language.

In the world of education, the same thing happens. In Indonesia, which is included in the expanding circle, there are still many problems faced by English teachers. One of the examples is, there are many schools that lack facilities as well as teaching resources. The problems and challenges faced by EFL teachers in Indonesia are still

many and complicated. Problems like unqualified English teachers, teachers who do not have any English language education background, the absence of good textbooks, insufficient school facilities, learners' lack of motivation, fear of speaking, and a lack of good Internet connection are still haunting these international language teachers. The society's mindset that does not prioritize education can also be a burden for Indonesian teachers, especially in remote areas or villages.

In Indonesia, more than 700 languages are spoken [2]. This refers to the local languages since there are 1340 ethnic groups in this archipelago [3]. According to information from EF Kids [4], Indonesia falls into the category of 50 countries with the lowest abilities in English language mastery in the world. In 2016, Indonesia was ranked 32nd among 72 other countries. In 2019, Indonesia was ranked 61st out of 100 registered countries. Compared to other Asian countries, in 2020, Indonesia was ranked 13th out of 25 Asian countries. This rank is still far below the average abilities of Vietnamese or Japanese people. These two nations are still far behind our neighboring countries like Malaysia and Singapore.

These data are supported by Januli (2019), as cited in WartaEkonomi.co.id [5]. Indonesia is included in the group of countries with low English mastery. Among 80 international countries, Indonesia is ranked 51st. Out of 21 Asian countries, Indonesia is ranked 13th. According to Kholid [6], in an Indonesian context, motivating students is still a challenge that is not easy. There are many policies on the English language at schools. Though there have been many efforts to respond to the existing weaknesses, these efforts cannot be realized as programs that motivate students.

Smpn8 [7] also supported this idea. They mentioned that in Indonesia there are several problems in teaching English as a foreign language. The first is a lack of motivation. Next, there is a lack of time scheduled for teaching the international language. This is followed by the next problem, inadequate human resources, and materials. Besides that, the excessive number of students in every classroom is also an obstacle for teachers in teaching English as a foreign language. On the other side, students who have abilities in English language skills are very limited, perhaps only 10% of all students.

From the data presented, it can be concluded that many Indonesians are still struggling in learning and mastering English language skills. Although we are living in a global world with intense exposure to mass media in English, still, it is not our mother tongue nor is it our second language. The bombardment of English via advertisements, news, films, songs, and social media these days can be a great help to learn this international language. However, many teachers still have to struggle hard in teaching.

The ideal condition is for all learners to be highly motivated so that teachers do not have any serious problems in teaching. Also, all schools should be well facilitated. Thus, the English language teaching-learning process will be enhanced. However, the reality is different. Looking at the gap between the ideal condition and the reality, the researcher thus conducted this case study, to reveal what problems six Indonesian EFL teachers encountered in teaching their students. There is one central question that guided this study: *What challenges are faced by six Indonesian EFL teachers in teaching?* This study will hopefully be useful for other teachers facing similar problems so that they can anticipate those problems and find the right solutions.

2. Theoretical foundation

Many people living in the world today are familiar with the idea of world Englishes. Matsukawa [8] mentioned that as seen from the number of speakers, English has become the language of non-native speakers. Throughout history, many

people have learned a foreign language based on several reasons. One reason is, they have been interested in the associated culture. The second reason is, they have lived in a society dominated by its native speakers. This, however, is no longer true for the vast majority of people learning English. The main purpose has shifted. It is to make themselves understood internationally. Most interactions in which English is used as a foreign or second language take place without any presence of native speakers.

People living in the *expanding circle* may be faced with lots of problems when learning English. Here, the status of English is a foreign language. According to Ashraf [9], there are some general problems faced by both EFL teachers and learners. These include a failure to maintain discipline in the classroom and demotivation which comes from both the teacher and learners. Besides that, there is also a failure to evaluate the strengths and weaknesses of each individual. Furthermore, teachers struggle to deal with physical and mental stress and fail to achieve learning outcomes. Also, there is a failure to create sound teacher-student relationships and establish an effective teaching environment.

Kdirbaeva and Usenova [10] reinforced this idea. They claimed that through the factual examination of the outcomes, various issues dealing with the instructors, the learners, the reading materials, and the strategies were revealed. These issues include instructors who do not utilize educational facilities while they are teaching and school libraries that are not well prepared to be beneficial for the learners of English. Besides that, classrooms are still far from perfect in terms of offices and physical conditions. Instructors who are not well-educated in English are also a problem. Another issue is the English reading materials are not appropriate for the student's level of capability. There is also a tendency for hard-working instructors to not receive honors.

Overcrowded classrooms are another problem put forward by Ashraf [9]. According to Ashraf, an overcrowded classroom can demotivate a teacher both mentally and physically (Hayes, 1997, in Ashraf [9]). To get the learners settled in the class, the teacher will naturally speak louder. This may affect the learners since it negatively creates a distance between the learners and the teacher. The teacher realizes the consequence and therefore suffers from stress. A large amount of class time is spent disciplining instead of educating the learners.

Ashraf [9] also mentioned communication problems. It is almost impossible for a teacher to maintain one-to-one communication with a class of 80 to 100 students using the target language. The teacher struggles even to remember the names of each individual. In a foreign language class, it is pertinent to invite learners to communicate in the target language (Liu & Zhao, 2010, as cited in Ashraf [9]). While dealing with a large group of learners, if the teacher fails to initiate interactions with individuals, the opportunity for the learners to communicate keeps dimming. Moreover, "Students feel isolated and are often anonymous to both the instructor and one another" (Svinicki & McKeachie, 2010, in Ashraf [9]).

Madalińska and Bavli [11] elaborated that there is another obstacle in the form of psychological problems like motivation and emotions. They mentioned that emotional inhibitions such as anxiety and sophophobia are significant challenges. Emotions have a significant impact on the cognitive process of learners (Agudo, 2018, in Madalińska & Bavli [11]). Emotions can be either enhancers or prohibitors towards learning. Studies on anxiety and learning in Turkey revealed that anxiety, especially speaking anxiety, is a barrier to students' learning (Er, 2015, as cited in Madalińska & Bavli [11]).

In addition, Madalińska and Bavli [11] claimed that the learning environment might also be a challenge for teachers. Large class sizes can reduce the time allocated for each student in a classroom. This impacts the quality of the instruction as it limits teachers' capacity to employ communicative teaching approaches, which require

active collaboration and communication during class (Madalińska and Bavli [11] citing from Copland, Garton, & Burns, 2014). English as a global lingua franca is the most preferred language for communication, academic, commercial, and techno-logical purposes in the world (Madalińska and Bavli [11], citing from Crystal, 2013; Agudo, 2018; Seidlhofer, 2001; and Statista, 2016).

In line with Madalińska and Bavli [11], Sirisha [12] mentioned that the attitudes of the students can also become a hindrance in English language learning. A rural student can find English a difficult language to learn. Even if a student has the desire to learn it, the fear of committing mistakes may make him/her develop a negative attitude towards speaking and learning the language. If the teacher takes an active role by conducting speaking sessions like debates, discussions, and role-plays, there can be more opportunities for students to interact with other students and teachers. Having audio-visual aids in classrooms and labs and providing listening and reading comprehension materials can also help to improve the competency of students in their speaking and listening skills simultaneously.

Sirisha [12] further claimed that all human beings' ways of thinking may not be the same. Some students are exceptionally talented in academics but not interested in doing well in their studies or getting skilled in the target language. For such stu-dents, the teacher should counsel them and tell them about the importance of the English language for their future lives and motivate them to take part in practicing the language skills. A lack of motivation among the learners, insufficient provision of audio-visual aids, and a lack of strict supervision are the challenges to overcome to make students more effective in English language learning and speaking.

All these challenges can be tackled if the teachers take an active part in building rapport with the class [12]. Besides that, teachers should set firm rules; for example, there will be no other language spoken in the class other than English. Asking students to always speak English with the teacher and their classmates can motivate students. In addition, the teacher can also correct their mistakes with care and organize interactive sessions like debates or role-plays. All of these help the students in learning the target language effec-tively. Sirisha [12] further explained that the teacher should become a good role model to the students. Using spoken and written English confidently will help students in adapting language usage in different situations and improve their interpersonal skills. The teacher should make the students capable of listening, speaking, reading, and writing as well as in interaction skills. This will enable students to be competent in the present world.

Sirisha [12] further stated that the socio-cultural background of an individual can also have a very strong impact on their mother tongue influences towards their English language teaching and learning. A teacher with a rural background can explain everything to a student while keeping the results-oriented objectives in mind. Students can obtain high scores on their exams. However, their target language com-petence cannot be improved. Another factor that affects English language teaching and learning is the teacher's inefficiency in making students aware of the basic skills of the language in terms of listening, reading, speaking, and writing. Many teachers prefer their students to practice more of their reading and writing skills but overlook the other two important skills of listening and speaking.

A lack of grammar knowledge and vocabulary can be another crucial problem for English language learners. Finegan [13] mentioned that grammar is the system of the sounds, structures, and meanings of a language. It is a system of patterns and elements, which organize linguistic expressions. All languages have grammar. People who speak the same language can communicate because they intuitively know the grammar system of that language. They know the rules of making meaning. Students who are

native speakers of English, meaning those who are in the inner circle already know English grammar. They recognize the sounds of English words, the meanings of those words, and the different ways of putting words together to make meaningful sentences. Effective grammar instruction begins with what students already know about grammar. Regarding vocabulary, Vierra [14] mentioned that vocabulary is essential in second and foreign language acquisition because, without its appropriate and sufficient knowledge, learners cannot understand others. Neither can they express their feelings. After a lengthy period of focusing on the development of grammatical competence, language instructors and researchers now recognize the importance of vocabulary learning.

Some previous studies in this area have been done. Tabatabaei and Pourakbari [15] conducted a study that was aimed at identifying the problems of teaching and learning English in the high schools of Isfahan, Iran. The data needed for the study was derived from questionnaires given to 200 randomly selected students. The participants were from the high schools of Isfahan and their English teachers.

Through the statistical analysis of the results, numerous problems regarding the teachers, learners, textbooks, and methods were revealed. First, the teachers did not use teaching aids during teaching. Besides that, the school libraries were not well equipped to be of service to the learners of English. Next, the classrooms were poor in terms of facilities and physical conditions. Fourth, the teachers did not teach in English. Moreover, the English textbooks were not suitable for the students' level of proficiency, and the Ministry of Education did not honor the hard-working teachers. These problems were only some among many others.

Another researcher, Nath [16], also researched this area. He found numerous problems at the root of the poor condition of teaching-learning English in the secondary schools of the North Tripura District. The teachers were not trained and they were not competent enough to teach learners in the way they should be taught. These teachers were not good models for spoken English or written English. They were not aware of the modern, innovative, creative, and efficient English language teaching approaches, methods, techniques, and materials, as they only mechanically used the age-old and almost outdated and ineffective Grammar Translation Method (GTM) extensively. The communication approach was hardly taken into consideration.

Nath [16] added that the learners were not exposed to the target language in the classroom. The students' mother tongue, Bengali, was the only medium of instruction in the classroom. They were exposed to it neither at home nor in their surrounding society or community. The only place where they could be exposed to English was in the classroom and it was only for a while. Therefore, these students could not generally be expected to be good at communication in the language.

Neither the teachers nor the learners were motivated to teach and learn. The teachers taught English simply because they had to. It was a compulsory subject and the learners studied it for the same reason. In other words, the teachers were concerned with how they could make the learners pass their examinations. None of them cared about whether proper teaching and learning ever took place. They were not aware of the fact that whatever they were teaching or whatever learners were learning would be useful in the future [16]. Shah [17], another researcher, researched students who dwelled in the rural areas of Jammu and Kashmir State. These students received education in rural schools. Sadly, they just became merely memorizing machines and they remained deprived of learning and improving their language skills.

Madalińska and Bavli [11] highlighted problems of students' motivation. Several shared challenges affecting teachers in both Poland and Turkey were identified, despite the contrast between these educational contexts. These challenges included students'

motivation to learn; students' emotional inhibitions; teaching large classes; differentiation; the need for the quality of in-service teachers' professional development; high teaching hours; the provision of pre-service teacher education; the attractiveness of the profession; and career-path incentives. Importantly, some of these challenges had not been highlighted in the literature to date. Other challenges were more localized, such as in-service professional development focused on developing teachers' competence in the English language.

Panchal [18] also focused on the quality of language education in Gujarat schools. The proficiency of teachers in language and their exposure to language and materials became the major concerns for the quality of the English language learning there. In reality, rural students' situations are very difficult. They do not have any opportunities, as city students do, like access to language labs or audio-visual aids. Generally, rural students study English as a subject, not as a language. It is the main obstacle for them. Most students read English only for the sake of an examination. Students of rural schools face several problems. English is their second language. Learning a second language means acquiring a system of rules. The students of rural and semi-urban areas in Gujarat face such problems because English is not their mother tongue. It is neither instinctive nor intuitive [18].

A similar case also happened to secondary school English teachers in rural areas in Bangladesh. Their schools did not have adequate facilities like language labs, classrooms with appropriate sizes, electricity supply for the library, and books availability [19]. Teevno [20] also reported in his research that his respondents, 11 English teachers of Sidh, Pakistan did not get proper training in teaching English. Besides that, they did not get proper facilities in teaching and the curriculum was not arranged based on the students' needs.

Panchal [18] explained that language acquisition appears to be a process of both analogy and application. It is also a process of nature and nurture. Undoubtedly, teachers of language have adopted and found various methods to teach English. However, students in rural schools still face several problems. English is not their first language. It is the second language for Indian students. Learning a second language means acquiring a new system of rules. Nevertheless, the students know very little about these rules. Some others do not know how the rule systems are acquired. Students are unable to express themselves properly in English. They have no idea of proper sentence structures. They do not know the proper pronunciation, spelling, and grammatical rules.

Another researcher, Ashraf [9], researched 35 EFL teachers from King Khalid University. These teachers teaching in different schools and colleges of Asir (southern) region participated in this study. The questionnaire for the EFL teachers was designed to identify and understand the remaining problems of EFL teaching in large classes from different perspectives. It contained 30 items along with a suggestion box. The questionnaires were distributed to 48 teachers. Thirty-five questionnaires were returned. The main finding was that overcrowded classrooms were distinctly demotivating for a teacher, and the demotivated teacher could never achieve success.

3. Research methodology

The design of this study was qualitative. Qualitative research is an approach that allows researchers to examine people's experiences in detail. The research methods commonly used are in-depth interviews, focus group discussion (FGD), observation, survey, diary study, or survey [21].

In this study, the participants were six English teachers. They were selected as participants because they were teaching in an area far away from the city center, except for Teacher F, and all of them faced challenges in their teaching. The teachers'

Initials		Teaching location	Home	Education
Teacher A	M	Public SHS, West Borneo	The same town as where the school is located	Bachelor's Degree
Teacher B	M	Public SHS, East Nusa Tenggara (NTT) Province	128.4 km from the school	Bachelor's Degree
Teacher C	M	Private SHS, a mountain Plateau, Central Java	The same town as where the school is located	Bachelor's Degree
Teacher D	F	Public JHS, East Nusa Tenggara (NTT) Province	34.9 km from the school	Bachelor's degree
Teacher E	F	Public SHS, East Nusa Tenggara (NTT) Province	The same town as where the school is located	Bachelor's Degree
Teacher F	F	Public Vocational School, Papua	The same town as where the school is located	Bachelor's Degree

Table 1.
Participants' data.

initials (A−F) were given based on the order of alphabets of their real names. **Table 1** presents the teachers' data. All of them held a Bachelor's degree.

3.1 Data collection methods

The data for this study were gathered through questionnaires and interviews. Questionnaires were distributed through email to each of the teacher participants on July 2, 2021. To validate the data derived from the questionnaires, in-depth interviews were done with the teachers individually. On July 3, 2021, individual interviews were conducted with Teacher A, Teacher B, and Teacher C. Interviews with Teacher D and Teacher E were carried out the following day, July 4, 2021. The interview with Teacher F was done on October 17, 2021. All interviews were done through Google Meet because it was difficult to conduct direct interviews due to the pandemic era. Besides that, the locations where the participants lived were far away from the researcher's hometown.

The data collection instruments used were questionnaires and interview questions. The questionnaires were attached as an appendix, while the interview questions were just used to confirm the teacher participants' answers in the questionnaires. After analyzing the questionnaire answers and transcribing all the interviews with the participants, the researcher then wrote the findings of the study regarding the participants' challenges in teaching.

3.2 Research validity and reliability

Qualitative research is different from quantitative research in many aspects. One of the aspects deals with validity and reliability. Leung [22] asserted that validity in qualitative research means appropriateness of the tools, processes, and data. Besides Leung, Syahla (2021) explained that in qualitative research, findings or data are valid if there are no differences between the ones reported in the research and what really happens in reality.

Leung [22] further asserted that the reliability of qualitative research is found in consistency. Syahlia [23] also explained that qualitative research is individual. It means it is different from one researcher to another. If there are five researchers with different backgrounds, there will be five different research different findings. It means that reliability in qualitative research is dynamic, always changing, and not consistent. Situations always change, so do human behaviors involved in them.

4. Findings and discussion

In this section, the results of the questionnaires and interviews are discussed. The respondents were six English teachers teaching at public as well as private schools. The teachers' initials were given alphabetically based on the alphabets of their real names, as shown in **Table 1**.

4.1 Challenges faced by teacher a

Teacher A was a young teacher, who taught at a public senior high school in West Borneo, Indonesia. He was about 27 years old. Teacher A graduated in 2017, and he had a great desire to continue his study and get a Master's Degree. From the questionnaire that he submitted, Teacher A experienced four big problems in his teaching.

The first problem was related to the pandemic era. Since he was teaching the tenth-grade students, he had never met his students in person. All the teaching-learning processes were conducted online. Teacher A admitted that he had difficulties remembering his students' faces. With his students, Teacher A had a *WhatsApp* group. However, not all the students used their real pictures. Some of them did not even write down their real names.

The second problem dealt with the clarity of instructions. Teacher A felt that his instructions had been clear enough for the students. However, many students were lazy to read the instructions, and they asked the teacher for the instructions instead of reading the instructions carefully. Although he was stressed out due to the "floods" of personal messages clarifying the instructions, Teacher A always tried to understand the situation of the pandemic era. This is what he mentioned in the questionnaire:

> *I give them instructions, which are very clear, the clearest in the universe. However, due to their laziness, they always ask me, even for trivial things. This makes me stressed out. I often use Indonesian, which is clear for them, but it's not enough. They shower me with personal WhatsApp messages. Whether I like it or not, I have to answer them.* (Teacher A's statement).

This problem was related to language use. It is about the use of the language in the instruction. Teacher A mentioned that he often used the mother tongue, Indonesian, to make the students understand the instructions. Still, some of them did not understand what to do. This frustrated Teacher A. As a solution, he asked his students to make a list of words in English related to the topic. If they were discussing the beach, for example, he would ask the students to make a list of all the words they know which are related to that particular topic. Hence, the students made some efforts in learning.

Another solution taken by Teacher A was asking the students to create dialogs based on the language structures that they learned in a particular chapter. In addition, Teacher A always tried to give questions requiring logic and reasoning. Thus, students' critical thinking would grow. Teacher A also tried to minimize students' plagiarism by setting the assignment submission so that only the student and the teacher could see the answers of an assignment.

4.2 Challenges faced by teacher B

Different from Teacher A, Teacher B faced more serious problems. The first problem that he faced was the distance between his hometown and the school. He

had to go to another town to teach. It was about one hour by motorcycle. The distance between the two cities meant different cultures. People in the two different areas speak different local languages. Teacher B lived on the border, and thus had a different local language from the one spoken by the students. This often caused communication difficulties. The socio-cultural gap did exist in this case. This is what Teacher B stated, "*The students can speak Bahasa Indonesia (the national language). But to communicate daily, they like to use their local language which I don't really understand.*"

Besides socio-cultural problems, Teacher B also observed that the students' literacy skills were still very low. Most of them had difficulties in the literacy of the four skills of English: reading, writing, speaking, listening, and counting abilities. The students also still had difficulties in using the right punctuation marks and in pronouncing the right words. In writing, they also seldom wrote in English, and they were not really interested in English. In listening, the students only learned from English songs that they got from social media. In speaking, they also experienced difficulties because they were shy and afraid to say something or made errors in their sentence structures.

Another problem faced by Teacher B was a lack of facilities experienced by the students. Most of the students did not have adequate facilities like good Internet connection, mobile phones, computers, or laptops. This is all related to the students' families' economic backgrounds. Most of the students came from middle to lower-class families.

To solve those problems, Teacher B always consulted with the headmaster and other teachers at his school. The headmaster and most of the teachers came from the same area as the students. Therefore, they knew the students' local language and traditions. What kept Teacher B motivated in teaching was that he liked teaching very much. Also, he loved the village's natural situation with the local wisdom, which was well taken care of. What demotivated him was the inadequacy of the facilities like a good Internet connection, projectors, whiteboards, and electricity blackouts that often happened.

4.3 Challenges faced by teacher C

Teacher C was teaching in a mountainous area in Central Java, Indonesia. Teacher C also faced a similar problem as Teacher B. His students' academic competence was below average. However, sometimes some students excelled and got accepted into a public university through the government's scholarship program. This made him happy and proud. The majority of the students, around 90%, came from lower-class families and they lived with their grandparents. Their parents went to big cities or abroad to work as migrant workers. Thus, in their daily lives, these students did not speak English at all.

This family background affected the students' motivation to study, including English. These students had very low motivation. It was mainly due to the lack of motivation and encouragement from their parents or other family members. Sometimes, parents admitted that they did not have any funds to send their children to school. The school then tried to give their children full scholarships, including school fees and uniforms. Still, many parents rejected the idea to send their children to school. They did not prioritize education. When it was harvesting time, parents would make their children skip school and help them in the field or plantation.

Teacher C's efforts to make his students get interested in English were all in vain. He conducted programs like *One-Day English* and *English Speaking Area*. None of the programs ran well. However, due to Teacher C's vision to make his students intelligent and smart, he kept going with his plans. Though it had not yielded any good results yet, Teacher C tried to be optimistic.

Sasongko [24] mentioned that poverty is an obstacle for parents to send their children to school. A family's financial condition is the trigger to involve children in the world of work. Presented in **Table 2** is the data of the total number of children who were working in 2018–2020, from every province in Indonesia. In East Nusa Tenggara, the number was quite high in 2020, at 5.67%. In Central Java, it was 2.71%; and in Papua, it was 3.49%. **Table 2** from Indonesian Statistics Bureau (BPS) will clarify this.

4.4 Challenges faced by teacher D

Teacher D lived in the same area as Teacher B, but she was teaching at a different school. Teacher D mentioned that her students' academic abilities were very low. Teacher D had been teaching at that school for six months and found that the students' abilities in speaking, writing, reading, and listening were still below her expectations. That is why Teacher D often used GTM (Grammar Translation Method) while teaching.

Another problem was that the students living in the remote area used their local language for daily communication. The national language, Bahasa Indonesia, was only used when they were talking to the teacher at school. The rest of the time, they spoke using their local language. Even when the students were discussing in small groups, they used their local language. Other than the problems mentioned above, these students also had very low motivation to learn English. Besides that, they did not have a good Internet connection, learning sources like textbooks, mobile phones, laptops, or computers.

What made Teacher D keep on going as she always thought that Indonesian children all had the same right to learn English. Though they learned a little in every meeting, at least they had learned something. Teacher D also mentioned that she did not have any special target in teaching. "*I don't have any special target in my teaching. I teach slowly, according to my students' pace of learning. If I force them to reach a certain target, the result won't be good; they will get nothing, and they won't understand the materials*," Teacher D explained.

This pandemic era made Teacher D exhausted. Since January 2021, she had to visit her students' houses one by one, distributing and explaining materials. Teacher D sometimes had to visit the houses more than once a week. If she only visited once a week, the children would not understand the materials. The distance from Teacher D's hometown to her school was about 35 kilometers.

This condition should be the concern of both the Indonesian government as well as the citizens. Currently, two-thirds of Indonesia's population is between the ages of 15 and 64, with a tremendous potential to achieve strong economic development and prosperity in the coming years. However, to take full advantage of this potential, Indonesia must work twice as hard to fill the development gaps in terms of education, health, and well-being of the youth. Earnest efforts are needed to improve educational quality [26].

Another common problem is the inequality of women and inequality in the rural population. This inequality causes child poverty as well as large gaps in water and sanitation. All this then leads to high rates of neonatal mortality, illnesses in children, and high stunting rates. In turn, all this has negative impacts on children's physical and cognitive growth all their lifetime [26].

4.5 Challenges faced by teacher E

Teacher E also taught in East Nusa Tenggara. Similar to the other four teachers, Teacher E mentioned that her students' English competence was below average. Most of the students went to school just to graduate and get the school certificate.

Province	Percentage and year		
	2018	**2019**	**2020**
Aceh	1.68	1.18	1.98
North Sumatera	4.29	4.01	6.39
West Sumatera	2.51	2.46	4.29
Riau	1.92	2.21	3.37
Jambi	2.88	2.06	2.43
South Sumatera	2.32	2.27	3.41
Bengkulu	2.56	1.99	2.98
Lampung	2.55	2.20	4.01
Bangka Belitung Archipelago	4.26	2.41	4.81
Riau Archipelago	1.09	0.98	1.19
DKI Jakarta	1.48	1.17	1.30
West Java	2.35	1.85	1.91
Central Java	1.98	2.17	2.31
Yogyakarta Administrative District	1.73	2.08	1.91
East Java	1.95	1.64	2.59
Banten	2.01	1.31	2.02
Bali	3.96	3.02	4.31
West Nusa Tenggara	3.94	4.08	6.55
East Nusa Tenggara	4.42	3.42	5.67
West Kalimantan	2.86	2.55	4.01
Central Kalimantan	3.32	3.06	4.81
South Kalimantan	2.89	2.31	3.11
East Kalimantan	2.04	1.43	3.11
North Kalimantan	2.11	2.66	4.84
North Sulawesi	1.61	2.45	3.15
Central Sulawesi	4.67	4.04	5.59
South Sulawesi	4.63	4.90	6.16
Southeast Sulawesi	5.32	5.26	8.05
Gorontalo	4.56	4.57	5.46
West Sulawesi	3.70	3.46	5.28
Maluku	2.14	3.04	3.35
North Maluku	2.42	3.51	3.80
West Papua	2.19	2.30	5.35
Papua	4.20	3.17	3.49
Indonesia	2.61	2.35	3.25

Source: BPS [25].

Table 2.
Percentages and the number of working children aged 10–17, 2018–2020, in all provinces in Indonesia.

Ninety-eight percent (98%) of the parents worked as farm laborers. That is why students' motivation to learn English was very low. Besides problems with motivation, there were also some other problems faced by Teacher E. There was an inadequate and

insufficient Internet connection. Besides that, blackouts often happened in that area. It disturbed the teaching/learning process.

Teacher E made some efforts to keep her students motivated in learning. She encouraged her students to practice vocabulary. She gave her students a target, that is, to memorize a minimum of 10 words in a day. Besides that, she made an English club though only four or sometimes six students joined the club. Teacher E also encouraged her students to keep learning English.

Students' great desire, which in turn increased their self-confidence, made Teacher E's motivation high in teaching. "*I myself get motivated when I see my students full of motivation and passion in learning English*," Teacher E stated. On the other hand, the fact that her students' motivation was just to graduate from the school and get the school certificate demotivated her. Motivation to pass an exam can be considered as external motivation. Gardner (2001, in Bower [27]) argued that a motivated learner would display three things: effort, desire, and affect. *Affect* refers to the emotional outcome, which is positive. Enjoyment, pleasure, and interest are examples of a positive emotional outcome. Intrinsic motivation, which is driven by positive attributes, is said to give more impact than external motivation. The need to pass an examination is an example of external motivation. Lamb (2004, in Bower [27]) stated that the need to interact through a global perspective has overridden the need to be interested in the target language, in this case, English culture.

4.6 Challenges faced by teacher F

Different from the other five teachers, Teacher F taught in a vocational school in a big city in Papua, Indonesia. In general, she did not face too many problems. There were three big problems that she thought hindered learning, which were students' motivation, the Internet connection, and the curriculum. In dealing with the Internet connection, Teacher F admitted that there was nothing she could do. She just hoped that the connection would get better and the provider would soon handle the recurring trouble and could provide a good, stable connection. About the curriculum, Teacher F mentioned that she could not do anything either, since it was decided by the central government.

Initials	Problems encountered	Solutions
Teacher A (M)	Students' difficulties in understanding instructions	Asking students to make a word list; asking students to create dialogs; using Bahasa Indonesia; giving questions that require critical thinking
Teacher B (M)	Low literacy skills, language barriers, socio-cultural problems	Consulting with the Headmaster and other teachers
Teacher C (M)	Students' academic competence (below average); students' financial condition; students' low motivation	One-Day English, English-Speaking Area
Teacher D (F)	Language barriers; students' low academic performance	Using Grammar Translation Method (GTM) in teaching
Teacher E (F)	Students' low competence in English; students' financial condition	Motivating the students
Teacher F (F)	Internet connection; students' motivation; curriculum	Guiding low-achieving students; reminding students of the importance of English; conducting peer tutorial

Table 3.
Summary of the teachers' problems and solutions.

The time given for English lessons was far from enough. It was only a 2-hour lesson for grade 10 each week, or approximately 80 minutes per week. Grade 11 and 12 students got a 3-hour lesson per week, which means 3 times 40 minutes, or 120 minutes (2 hours) per week. "*During this pandemic, one lesson hour is even shorter than that,*" Teacher F explained. Time to learn this international language was very limited.

There were some efforts that Teacher F had done in dealing with motivation. First, she gave special guidance to students who had low achievements. She gave them special attention and was willing to give extra lessons outside of the school hours if needed. Besides that, she also tried to remind the students about the importance of learning English. The last effort that she did was choosing peer tutors to help other classmates who were weak and had difficulties in learning. The teachers' problems and the solutions are summarized in **Table 3**.

5. Conclusion

From all the teachers' narratives about the difficulties and solutions they implemented, several conclusions can be drawn. First, every teacher has their own way to teach and adjust their way of teaching in this pandemic era. Secondly, it has to be noticed that every solution should be adjusted with the class situation. No methods are the best methods. The teacher is the one who knows the situation best, and all methods should be adjusted with the class situation.

The next conclusion is that no matter what the students' family conditions are, teachers need to keep motivating these students. Motivation is one of the key factors that determine students' success in their language learning. It is like fuel that keeps vehicles running. Without motivation, language learners will lose their spirit to learn and may come to a stagnant point.

The research questions in this study have thus been answered and summarized in **Table 3**. This study, however, has its limitations in terms of the number of participants and coverage of topics. There were only six participants, and the discussion focused on the teachers' problems and solutions. Future researchers can include more participants and delve into more complex topics like teaching media or teaching techniques.

Appendices

A.1 Questionnaire for teachers

Dear Respondents, please answer the following questions. The answers can be written in Indonesian or English. Thank you.

1. Where do you teach? How many students do you have?

2. Please describe your students' academic abilities in general.

3. Please describe your students' economic condition in general.

4. How are your students' abilities in reading, writing, listening, and speaking in English?

5. What obstacles do you face in teaching English? Please put a checkmark (√).

    a. Inadequate school facilities.

    b. Bad Internet connection.

    c. Low English competence of the students.

    d. The low motivation of the students.

    e. Your low motivation in teaching.

    f. Other problems:

6. What steps do you take to deal with these problems?

7. What things motivate you the most in teaching?

8. What things demotivate you the most in teaching?

Please complete the table about your data.
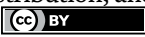
Name	Teaching experiences	Experiences teaching English in your current school	Educational background

Author details

Listyani Listyani
English Language Education Program (ELEP), Faculty of Language and Arts (FLA), UKSW, Salatiga, Indonesia

*Address all correspondence to: listyani.listyani@uksw.edu

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Chapter 24

A Multi-Disciplinary Undergraduate Pedagogical Experience Looking at Attitudes Towards Solar Development in the Mojave Desert

Jennifer Moore Bernstein, Cameron Audras,
Charmaine Dalisay and Jennifer Swift

Abstract

This research project aimed to integrate geography, spatial analysis, environmental studies, and social psychology to understand conflicts over solar development in the Mojave Desert region. A second objective was to empower the participating undergraduate student researchers with a deep-learning experience using multidisciplinary tools. This project ran from 2019 to 2021 under the Undergraduate Research Associates Program (URAP) at the University of Southern California. The students conducted site suitability analysis, survey research, interviews, and field studies. Results combined spatial analysis, attitudinal surveys, mapping, and detailed accounts of the students' learning experiences. An important conclusion of this project was the discovery of a discrepancy between broad support for solar development at the state and national level, and a suspicion at the local level The student researchers went on to present multiple conferences and receive awards, and based on this project, both decided to attend graduate school in environmental studies and sciences. Recommendations for further research include interpolation of attitudes toward solar development, conducting a demographically representative survey, and participatory mapping. This approach can serve as a pedagogical strategy for other institutions, as students are increasingly eager to address environmental problem solving from the perspective of both the natural and social sciences.

Keywords: pedagogy, field studies, interdisciplinarity, solar power, undergraduate, Mojave

1. Introduction

Bombay Beach, near the Salton Sea in southeastern California, is a unique place. It was once a popular resort town in the 1950's and 1960's, attracting the residents of Los Angeles to a beach in the middle of the desert. But the Salton Sea, it itself a human

accident, became increasingly polluted with agricultural runoff, and with the smell of the dead fish that would wash up on shore and the algal blooms, tourism decreased dramatically. The resident population of Bombay Beach aged or left. But within the last 10 years, artists and writers have begun to re-inhabit the census designated place (population 295 as of 2010), turning dilapidated trailers into gallery spaces and creating huge installations by the water. Harkening back to the town's past is the only restaurant for miles, called the "Ski Inn", though jet skis have long since skied out.

The project featured in this chapter does not focus on tourism in the Mojave Desert. Rather, it was designed to help undergraduate students understand the complexities of the attitudes of area residents towards different types of solar development in the Mojave Desert. Namely, what is the proper place for solar development? How do residents feel about it? Why is there such a strong discrepancy between attitudes towards residential and industrial scale solar? So why, on one of our field visits, did we (an undergraduate researcher and the Principle Investigator) spend half a day at Bombay Beach and the Salton Sea?

Most solar developments, in the Mojave Desert and elsewhere, begin with site suitability analysis. A number of variables – slope, aspect, parcel size, zoning- are overlayed using a Geographic Information System (GIS), and ideal locations for solar are identified. However there is a history of community opposition to solar development in the very regions it makes the most technical sense. Much of the opposition to solar installations in the Mojave, industrial and residential, comes down to government policies, corporate management, and (of particular applicability to this project), attitudes of local residents. These attitudes are not easily attributed to the pejorative concept of NIMBYism ("Not in my Backyard") or attitudes towards renewable energy itself.

The reason the Principal Investigator chose to visit Bombay Beach was to better understand the broader geographic and historical context in which any type of development takes place. While not directly related to solar development, these types of appropriation of land by corporations has a long history that is deeply rooted in the local psyche. Thus, when trying to understand attitudes towards one type of development, one must understand the region as a whole. This visit was part of a larger pedagogical approach with sought to provide students with firsthand readings of the landscape, in addition to a multi-methodological analysis of attitudes towards development, especially solar, across the Mojave desert.

Geographers interpret places not as entities in and of themselves with a fixed set of characteristics, but rather as nodes through which various flows intersect- economic, human, transportation, environmental- and shape the ongoing evolution of a place. Students are increasingly aware of and concerned about the intersection of human and environmental communities, and looking for skill sets to be able to gather multiple types of data to solve a problem. Providing students with the tools to address environmental problem solving, be they analytical, technical, or quantitative, comprises a critical aspect of contemporary environmental studies and sciences/geography pedagogy.

This project, while rooted in geography and spatial science, has very explicit connections with the field of environmental studies and sciences. The Association for Environmental Studies and Sciences (AESS; ESS) is the prominent professional higher-education field encompassing ESS, and explicitly states that "broad advances in environmental knowledge require disciplinary, interdisciplinary, and transdisciplinary approaches to research and learning". Student demand for programs at the undergraduate and graduate level is steadily increasing [1]. Though many programs in natural resource management have experienced a slight decline in the last 20+ years, this is likely due to individual departments capitalizing on the broader environmental

concerns of their student population and shifting to a less extractive framing [2]. Other programs have "rebranded" their identity and restructured their content, often using sustainability as a uniting factor across disciplines. The number of active sustainability groups on campuses has skyrocketed. Many geography departments have added "environment" to their name. This all represents an incredible opportunity for educators to facilitate students becoming effective problem solvers and suggests that more students will be seeking the tools needed to have a viable career addressing both the human and the biophysical aspects of environmental problems.

As ESS has grown, there has been a robust discussion about how to best structure, teach, and assess the programs in the name of academic rigor [3]. Multidisciplinary pedagogy, in which this project is grounded, attempts to create students equipped to wrestle with complex problems. The approach recognizes the way in which all disciplines are partial. Soulé and Press [4] received ample criticism and pushback when they suggested that the increasing interdisciplinarity and multiple perspectives of ESS programs threatened careful scholarship, leaving students with a grab bag of skill sets and broad and shallow fields of knowledge. However Soulé and Press, as Maniates and Whissel argue, make a key oversight in assuming that interdisciplinary teaching, thinking, and learning inherently creates conflict. Soulé and Press's argument has since been largely seen as a straw man. In the years since, the field has cohered around the concepts offered by the National Council for Science (NCSE)'s report, "Interdisciplinary Environmental and Sustainability Education on the Nation's Campuses 2012: Curriculum Design" [5]. This includes the following concepts. "(1) The ideal ESS curriculum builds on diverse forms of knowledge; (2) This diverse knowledge can be organized into major curricular models; and (3) sustainability integrates these curricular models" [6][1]. Others have demonstrated that despite these goals, syllabi are not diverse enough. In their review of undergraduate environmental studies syllabi, Kennedy and Ho [7] found three major discourse typologies, though some were over-represented while others were under-represented. They ultimately advocate that faculty consistently monitor their own blind spots and ideological prejudices, allowing students to come to their own conclusions about approaching environmental challenges.

In addition to interdisciplinarity thinking and problem solving, a key component of ESS is field work. For many reasons, including that there is a field-based component in many ESS professions, fieldwork has long been understood to be an integral component of ESS curricula [8, 9]. While part of this is content-based, much of it is affective. Students increase information retention, and also simply enjoy field trips, increasing recruitment. Fieldwork has also been associated with the principles of deep learning through experience [10]. That said, fieldwork is not without its critics. For example, within the field of geography the pedagogical benefits have been challenged. A number of factors, both logistical, and financial, have made fieldwork much more difficult for institutions of higher education to facilitate, even when they value its educational merits [11].

One of the most critical impediments beginning in 2020 has been the COVID-19 global pandemic. Social distancing, avoiding indoor spaces, remaining home as much as possible, and masking all placed huge strains on fieldwork, if not making it outright impossible. Equally challenging is the inability to effectively plan for fieldwork, given the amount of work, financial commitment, and logistics that go into the simplest of field excursions. A number of researchers have suggested ways to work through these

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[1] Note that Proctor also argues that this study lacks theoretical depth and demonstrates conceptual leaps.

challenges, including contingency planning, recognizing the role of the virtual word as our contemporary "field", and the ways to incorporate citizen science in data collection. Many of these trends existed far before the advent of COVID-19, and perhaps researchers being pushed out of their comfort zones will help develop them further [12].

These approaches—interdisciplinarity, field work, multi-methodological research tools—are housed under the larger umbrella of critical geography. Within the field of spatial science, the last 20 years have shown exponential growth in the world of "big data", with ever more accessible tools for processing and visualizing data. While hugely beneficial for researchers and citizens (and often quite lucrative) some have argued that geography is increasingly done on a screen [13]. A researcher could come to normative conclusions and policy descriptions for a location without ever having visited, thus bypassing citizen engagement, local knowledge, and a general "sense of place". The methods we chose for this project, including fieldwork, surveys, participatory mapping, and interviews, were intended to engage deeply with the actors involved in this issue, in an attempt to avoid a detached and mechanized view of the region.

This project ran from 2019 to 2021 under the umbrella of the Undergraduate Research Associates Program (URAP) at the University of Southern California. The URAP program is intended to expose undergraduates to research opportunities typical of graduate level research, namely "learning as inquiry". This program is of particular interest to students pursuing graduate school, as they will be better prepared to develop research questions, conduct independent research, and draw well-reasoned conclusions. Faculty mentor small groups of students, or even one student at a time, providing them with an invaluable learning and research experience. The Primary Investigator is given a small stipend allotted to funding students, with a small portion available for supplies.

Students associated with the Spatial Sciences Institute (SSI) at USC are provided with a number of URAP projects, which faculty have already applied for and had funded. Within the Spatial Sciences Institute, students rank the projects they would most like to work on. Both years, this project was highly popular, demonstrating the demand from students for research involving environmental problem solving, multi-disciplinarity, and field-based research. One student was selected each year, though the first student (a co-author of this article) remained involved in the project during the second year of its iteration. At the completion of the project, both students went on to present at a number of academic conferences, which will be discussed later in the chapter.

2. Project background

Americans are increasingly concerned about climate change, and one of the most widely championed ways to address it is through renewable energy [14, 15]. According to pollsters, Americans are highly supportive of solar power. In a Gallup poll, solar energy was endorsed by the public more than any other alternative energy source. In the same poll, solar energy was backed by a large majority in each political party, and even more so in the West than in other regions of the country [16]. In 2016, the Renewable Energy Action Team—the California Energy Commission, California Department of Fish and Wildlife, the U.S. Bureau of Land Management, and the U.S. Fish and Wildlife Service—identified potential renewable energy development areas in Southeastern California based on multiple criteria, including quality of resources, land ownership, slope, access, transmission, and capacity for production. These criteria were mapped and used as a guide for locating future solar energy installations (See **Figure 1**).
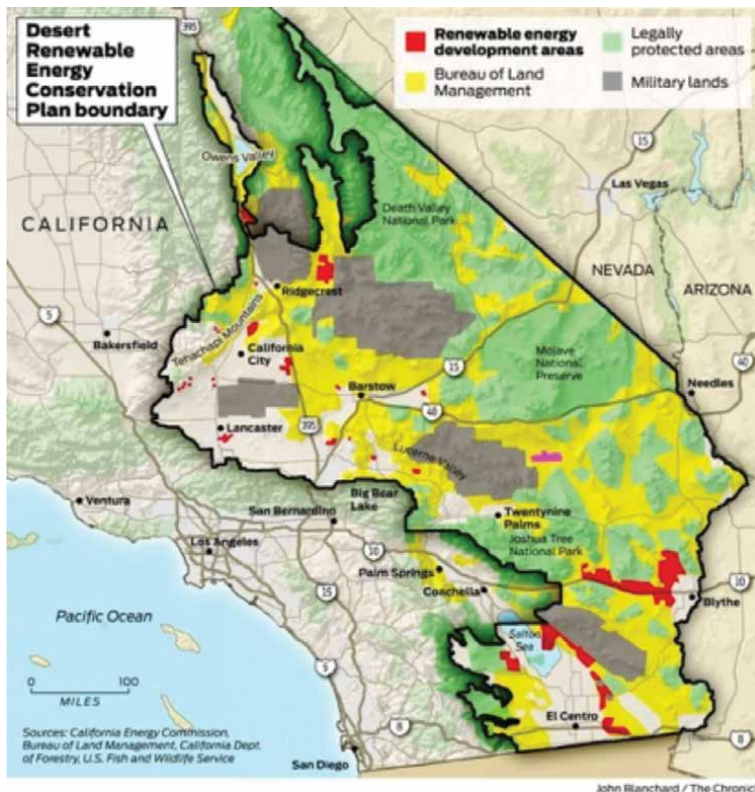
Figure 1.
DCREP boundary and land use.

The importance of eliminating fossil fuels from the global energy portfolio has been well-established. However, the local consequences of doing so deserve attention as well. Despite the Mojave being a desert region with little precipitation, it contains over two thousand species, with 15–18% more to be discovered. One species is the desert tortoise (*Gopherus agassizii*), listed as threatened under the Endangered Species Act. Desert tortoises are "ecological engineers" who create burrows in the ground that provides shelter for many other animal species, allowing them to escape the heat of the desert. They are an **umbrella species**, meaning that they provide protection for other plants and animals in their area.

At present, there are 744 industrial scale solar plants operating in California. Some of the largest are in the Southeastern desert region of the state. Some of the largest plants in southeastern California are listed below (**Table 1**).

The map in **Figure 1** includes typical variables related to site suitability analysis, and this is certainly the first step in the appropriate siting of industrial-scale solar. But it does not include a key variable- the attitudes of area residents towards alternative energy development. Even with the identification of the correct slope, aspect, parcel size, and more, oftentimes projects are hamstrung due public opposition rather than site suitability. In the Mojave, many industrial-scale solar projects have been effectively halted by the general public, with many failing to get approval (e.g., a 3 mw plant in Landers; a 20 mw plant in 29 Palms). Recently, the President's Interior Department decided that Palen Solar would be built just south of Joshua Tree National Park. Palen would/will be a 3100 acre, 500-megawatt power plant able to deliver power to 17,000 residents in Palm

Name	Location	Type
Ivanpah	Nipton, CA	Concentrated solar thermal
Genesis	Blythe, CA	Parabolic trough (curved solar thermal collector)
McCoy	Blythe, CA	Photovoltaic
California Valley Solar Ranch	Santa Margarita, CA	Photovoltaic

Table 1.
Largest solar plants in California.

Springs, California. With this project, there is a general attitude of distrust between alternative energy developers, community residents, and government authorities. But little systematic assessment has been conducted as to the specific attitudinal variables affecting opposition to solar development.

The construction of solar installations can be problematic for local and global ecosystems, as well as workers along the commodity chains. For one, solar panels are made up of rare earth elements that are difficult to extract and find and whose extraction have major ecological consequences. Most of these elements, such as lithium and cobalt, are resourced from China. Another factor that contributes to the surface disturbance of desert land is the cooling technology used in industrial-scale solar. Water is scarce in the desert, so therefore dry and wet-cooling systems are utilized for concentration. Despite their efficiency, they use copious amounts of water per kilowatt hour. A dry cooling system has a large carbon footprint. Industrial solar sites also transform the land through the construction of roads and infrastructure, including the removal of vegetation and grading. Construction produces dust, which can alter ecological processes such as the fertility and water retention possibilities of soil. It can also damage plant species due to root exposure, burial, and abrasion to their leaves and stems. This damage can reduce production and will indirectly affect the wildlife that depend on these plants for food. When bulldozing a site, developers often clear ancient creosote. Road construction also impacts wildlife corridors, dividing animal habitats. All in all, despite the positive impact of solar development globally, often local ecosystems and communities are negatively affected in the process.

This project did not set out to demonize or valorize industrial scale solar. Rather, it took the approach that "education is not indoctrination" (Proctor 2016, personal communication), allowing students to wrestle with the pressing need to decarbonize *and* impacts of solar development on ecosystems and communities. Solar development, in all forms, is often assumed to be unequivocally good [17]. Those who advocate for solar development must be fully cognizant of its broader ramifications, and recognize the need for cleaner supply chains, workers' rights, and incorporation of local voices in installation location decisions.

3. Project methodology

As discussed, the methodology employed in this project had two objectives. The first was to attempt to integrate geography, spatial analysis, environmental studies, and social psychology to better understand (and ideally help solve) conflicts over solar development in the Mojave desert region. The second was to empower students

with a deep-learning experience using multidisciplinary tools, and develop skills that they could carry into their academic and professional lives.

Throughout the course of the URAP, students met weekly with the Primary Investigator and other USC faculty associated with the project. Each student had a high degree of agency in developing their own goals and timelines based on their academic and professional interests. While a schedule was developed at the beginning of the academic year, the schedules were modified as the students' interests grew and developed.

3.1 Spatial analysis

Both students conducted spatial analysis to better understand the dynamics influencing solar development in the Mojave. Spatial analysis is the computation of geographic data to visualize and solve spatial questions and phenomenon. This required that students identify data sets, process and clean them, and learn how to use software to answer key research questions. For this project, both students used Esri ArcGIS. The 2019–2020 mapped the spatial overlap between biodiversity and electric substations, as well as other phenomenon. The 2020–2021 student mapped favorability towards residential and industrial-scale solar by zip code. These exercises enabled students to understand components of the broader landscape (location of alternative energy facilities, endangered/threatened species, climate, slope and aspect, etc.) as well as their connection with the attitudes of residents.

3.2 Interviews

Interviews are a means of gathering information that allows for in-depth responses to key research questions. This project recruited participants via various Mojave desert Facebook groups, including "Explorers of the Mojave Desert," "What's Really Happening in the Desert – Coachella Valley & Hi-Desert," NO Dollar General in Joshua Tree," "Victorville, Buy Sell, Trade, Advertise," "Twentynine palms buy/sell/trade/ advertise," "Coachella Valley Buy/Sell/Trade," "29 palms/Joshua tree/Yucca Valley-Yard Sales," "Joshua Tree's Totally Unofficial Tourism Bureau," "Henderson Nevada, (Buy, Sell or trade)," "What's really going on in 29 Palms," "Mysterious Mojave Desert and Southwest USA," "Save Red Rock Canyon," and "Friends of Joshua Tree." The 2019–2020 student conducted 8 interviews with stakeholders, each of which lasted approximately 30 minutes. One interview with a key stakeholder was conducted in February 2021. While the researchers offered a face-to-face opportunity for interviews, the COVID-19 pandemic prohibited travel to the regions. Interviews were conducted via phone and videoconferencing. Question items asked about attitudes towards solar development, proximity, local impacts, and climate change, as well as basic demographics.

3.3 Survey

The researchers developed and fielded a convenience survey, distributing it via the Facebook groups mentioned above, as well as the Mojave Desert Land Trust (MLDT) listserv. While this survey was not demographically representative, it provided a quick, expedient means of gathering information on the topic. The survey replicated many of the question items deployed by Carlisle [18] on public attitudes regarding large-scale solar, especially with respect to perceptions of appropriate proximity. The survey (n = 106) was fielded in 2020 between the months of November and December, and again in January 2021. Respondents' demographics are described in

Demographics		
Age	19-24	3%
	25-34	8%
	35-44	14%
	45-54	14%
	55-64	33%
	65+	28%
Race/ethnicity	White/Caucasian	86%
	Hispanic/Latino	6%
	Biracial	3%
	Other/Missing	6%
Education	High school or less	5%
	Some college	28%
	Vocational/Trade school	3%
	Completed college	39%
	Masters/JD/PhD	26%
County of residence	Arizona (NV)	5%
	Inyo	2%
	Kern	16%
	Los Angeles	10%
	Nevada (NV)	5%
	Orange	3%
	Riverside	4%
	San Bernardino	49%
	Other (CA)	8%

Table 2.
Demographics of survey respondents (n = 106).

Table 2. Because the full survey data wasn't fielded until late in the second year of the project, only basic descriptive statistics and simple correlations were analyzed and visualized.

3.4 Field work

As discussed in the introduction, field work can be a profound aspect of research. It enables a sense of deep learning that is harder to access within a classroom setting, and within the fields of geography, environmental studies, and spatial science, it is especially important. Objections to the field of spatial science often involve the "view from above", wherein analysts come to conclusions about a place without ever having spoken to people in the region, or experienced the landscape firsthand. Field research is an opportunity for active learning, where students and involved in inquiry and engaged in their learning process.

During the 2019–2020 school year, the URAP student participated in two visits to the field, both with a USC professor. The first trip, in January 2020, toured the San Gorgonio Pass wind farm, one of the largest wind farms in California. The second trip, conducted with the same student but a different faculty member, occurred in February 2020. This involved a number of activities intended to expose the student to the broader landscape of the Mojave, including site visits to the Salton Sea, Bombay Beach, Joshua Tree National Park, art installations, and of course, solar farms. Originally, the researchers planned to interview residents face-to-face while in the field, but temporal and geographic constraints proved prohibitive.

The COVID-19 pandemic prevented the 2020–2021 URAP student from engaging in a field-based experience. The challenges of the pandemic for fieldwork are not unrecognized, and many researchers are reassessing a landscape in which there may never be a "return to normal" [19]. Thus, researchers must not rush to return to fieldwork in potentially risky situations, but rather develop new protocols to facilitate engagement without sacrificing safety. The 2020–2021 URAP student conducted phone interviews, reached out to community members virtually, and attempted to understand the landscape through other means.

3.5 Student feedback

At the conclusion of the project, both students responded to a series of open-ended questions regarding the project. These covered skills gained, their experience with fieldwork, multi-methodological research, and the impact of the project on their academic and professional trajectories.

4. Discussion: key findings

4.1 Attitudinal research

As previously stated, the survey (*n* = 106) was a convenience sample distributed via various Facebook pages (see list in "Interviews" section). The results of this survey should be interpreted as suggestive.

The demographics of this survey are not representative of the U.S. population, but they are suggestive with respect to the demographic composition of the Mojave desert region. For one, many of the respondents skewed older than the general population. This may be due to a combination of the high population of individuals who retire to the region, as well as the tendency of retirees to have more free time and thus engage in volunteer work and as other advocacy issues. Racially, the vast majority of respondents identified as Caucasian, and notably under-represented are people of color. The sample was highly educated, with 65% being college educated or more. With respect to county of residence, San Bernardino residents comprised nearly half the sample. Given the overlap between the Mojave desert region and San Bernardino county, this is understandable.

4.1.1 Survey findings

The survey was analyzed with respect to basic descriptive statistics, as well as the degree to which there were inter-item correlations. There were a number of suggestive

correlations between question items. Supporters of solar are consistent with respect to the ways in which they would accept solar development in close proximity to their residence because of the jobs and general benefit would bring to the area. Further, there appears to be a second set of related attitudes regarding the siting of solar away from different factors deemed as valuable, such as wetlands, wildlife habitat, wildlife migration routes, and recreation areas (**Table 3**).

4.2 Mapping and spatial analysis

Both students conducted spatial analysis using a number of data sets. The 2019–2020 student used spatial analysis to develop a number of illustrative maps for a publicly available story map, including the relationship between alternative energy installations and wildlife habitat, for example (See **Figures 1** and **2**).

The 2020–2021 student used the survey data to create an index of support for solar, both residential and industrial. They went on to map the data by zip code and visualize the results via an Esri ArcGIS map. In general, the map demonstrated the way in which pro-solar attitudes are clustered in urban areas, far away from where the industrial scale installations are located (**Figure 3**).

4.3 Student feedback

Both students responded to a set of open-ended questions developed by the Primary Investigator. These questions were designed to assess the pedagogical effectiveness of the URAP project and get a sense of how the project could be modified to better fulfill student goals and objectives.

Item 1	Item 2	Correlation
Support for industrial solar	Support for solar development near residence	.81
Support for industrial solar	Benefit of large solar facilities in the area	.66
Industrial solar would be good for the area	Support for solar development near residence	.72
Employment from large scale solar would help the area	Support for solar development near residence	.77
Solar distanced from wildlife migration routes	Solar distanced from nesting sites/breeding grounds by wildlife	.88
Solar distanced from wetlands	Solar distanced from areas of cultural or historical importance	.66
Solar distanced from wildlife migration routes	Solar distanced from areas of cultural or historical importance	.68
Solar distanced from wildlife migration routes	Recreation areas	.71
Solar distanced from wetlands	Recreation areas	.75
Solar distanced from wildlife migration routes	Wetlands	.85

Table 3.
Selected correlations between survey question items.

Figure 2.
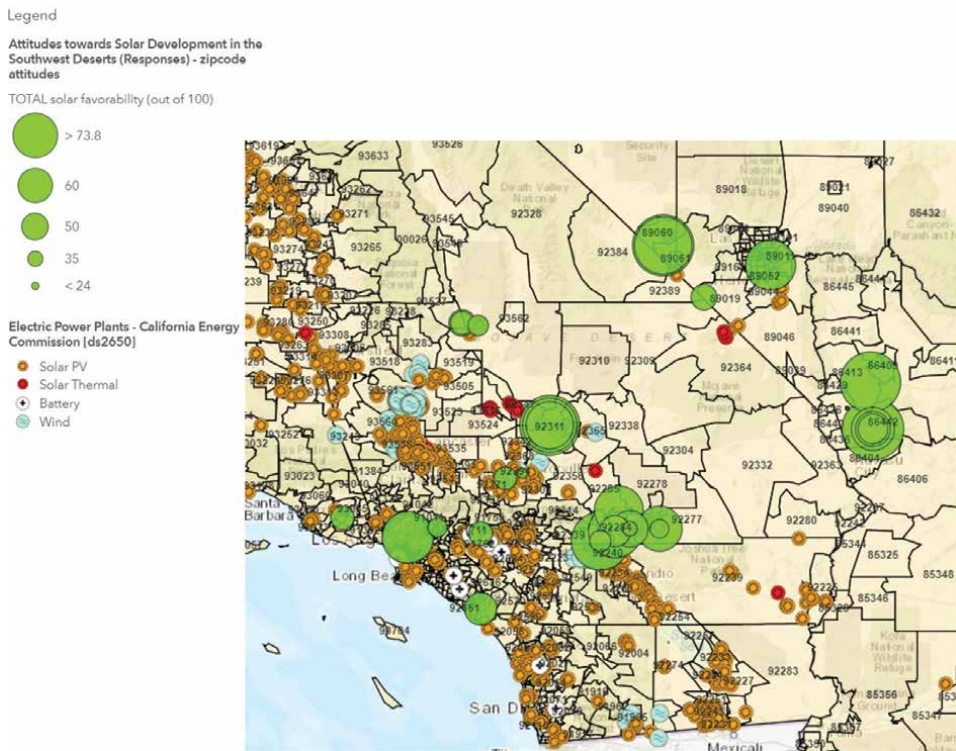*Solar installations (green points) and highways (red) in relation to desert tortoise habitats (pink).*

Figure 3.
Support for solar development by zip code.

4.3.1 Skills gained

The student researchers were asked as to the skills they gained from this experience. Both students reported that they gained critical thinking skills, which facilitated their understanding of interdisciplinary thinking.

> *"Since we did multiple methods of gathering information (reading academic papers, visiting solar sites, interviews, and surveys), I developed my critical thinking skills to become more interdisciplinary." – 2019–2020 URAP Student.*

In the spirit of science communication, many of the technical science fields attempt to use social science methods to broaden the reach of their research and get a better understanding of their audience. But oftentimes, surveys are undertaken without an understanding of proper methodology, which has been long standardized and vetted within the social sciences. Just like in the "hard" sciences, there are ways to design data collection to be less likely to gather poor quality data. Both students were rooted in the spatial and environmental sciences, and thus were initially less well-versed in social science research methods at the start of the project. They both stated that the methodologies they gained throughout the course of the project enabled them to better understand the social sciences, including surveys and interviews. Related, one student mentioned that the skill set acquired by applying for and presenting at conferences made them better able to communicate their research findings to a broad audience.

One additional skill that was reported by a student was the ability to interact with different types of stakeholders using different forms of communication (written, verbal, etc.). This was executed during the recruitment of interview participants and participatory mapping. The practices involved developing email requests, interview scripts, and ultimately facilitating interviews. These skill are undoubtedly important within the realm of science communication.

4.3.2 Fieldwork

As previously discussed, the first year of this project (2019–2020) allowed for field visits, while the second year (2020–2021) did not due to the COVID-19 pandemic. This was not ideal, but allowed for the opportunity to explore the ways in which fieldwork has been irrevocably changed in the context of global pandemics. Other factors such as climate change will inevitably force researchers to identify ways to gather the type of data that one might in the field in other ways.

Even without a global pandemic, however, fieldwork—wherein a primary researcher and students have funding to go out into the field for months or even years on end—is becoming increasingly unrealistic. For one, Masters and PhD students are ever more non-traditional, meaning that the structure of their lives do not harbor the flexibility of many students in their late teens and early twenties. Further, funding issues, scheduling, and other logistics can make site visits a challenge. In the spirit of looking for a silver lining, the pandemic forced students and faculty to become more proficient in alternate means of exploring regions, doing what is possible to achieve the benefits of a field experience in a virtual or hybrid space. Thus, this project had to be flexible and nimble in achieving its original goals.

The student who was able to incorporate a field component felt as though they developed a new perspective on the place versus the one that had gathered through

spatial analysis alone. They felt as though visiting the region, meeting people, and seeing the landscape allowed for them to understand the local perspective, insofar as that the desert is not simply a barren wasteland on which corporations can project whatever vision they have for their bottom line. Similarly, on the field trip, this student recognized that the desert was far from an ecologically and biologically bereft region. The student wrote:

> *"I realized that many people actually do not understand that the desert is not barren. Prior to going to the desert, I had the same idea. Seeing the rich biodiversity of the Mojave gave me an idea for how I wanted to start my StoryMap – with the importance of desert biology and what it means to residents." - 2019–2020 URAP student.*

Without visiting an area and exploring the local ecology, especially in an arid area where flora and fauna are subtle, it may be easier for stakeholders to see the landscape as interchangeable or dispensable. This student found an increased appreciation for the biodiversity of the ecosystem, thus better understanding why residents felt so strongly about protecting the local ecology, as well as contributing to the way they saw the controversial local issues.

The 2020–2021 student was unable to incorporate a field component due to the COVID-19 pandemic. However, as previously discussed, the purely field-based model will no longer be practical in years to come, for multiple reasons. The skills gained by this student will thus facilitate their resilience in an increasingly uncertain future. They wrote about the ways in which they became more adaptable. In particular, their written and verbal communication skills became more sophisticated, as well as their use of virtual tools that became increasingly popular during the pandemic. While not fieldwork per se, they enabled the student to engage with residents in the region and made them more nimble with respect to changes in research directions.

4.3.3 Multi-methodological research

Both students believed that they could not have fully understood the topic to the extent that they eventually did without using multiple methodologies. Said a student:

> *"I have never used quite the range of disciplines and tools that this project has exposed me to, especially to answer a singular question. Having different lenses allowed me to exercise my visual and auditory learning skills and feel much more deeply engaged in the topic." - 2020–2021 URAP student.*

Both reported that using multiple methods enabled them to better understand the range of opinions informing the topic.

4.3.4 Impact on academic career

Both students presented their research at a number of academic conferences, including the Association of American Geographers annual meeting, the University Consortium for Geographic Science, the Association for Environmental Studies and Sciences conference, and the Los Angeles Geospatial Summit. This involved developing project abstracts tailored to a particular conference theme, identifying appropriate panels, and creating presentations designed for wide and expert audiences.

Perhaps most profoundly, both students independently reported that the project strongly influenced their decision to apply (and be admitted to) graduate school in environmental studies and sciences. Further, both students stated that their approach to environmental problem solving had become multidisciplinary, recognizing the importance of both the environmental and social sciences. This experience invigorated students to think differently about their academic and professional careers, as well as how they will approach these spaces with a methodological toolbox capable of environmental problem solving in a complex world.

5. Conclusions

This research project provided a case study wherein undergraduate students used multidisciplinary research to better understand conflicts in the Mojave Desert around solar development. Overall, there were some key conclusions drawn about the topic area generally. The driving question examined in this project was why there was a discrepancy between a broad support for massive solar development at the state and national level, and a suspicion or downright opposition at the local level. Each student in this project came to a different conclusions about this situation. One student emerged highly skeptical of industrial scale solar development, given the way in which it impacts local flora and fauna. The second student completed the project thinking about the ways in which historical development in the region influences certain attitudes. Namely, this student felt as though residents were more suspicious of corporate agency over the region than industrial scale solar itself. Each student expressed this in the outcomes from the project, including the Esri StoryMap and at conference presentations. That both students came away from the project with a different skill set and different understandings of solar development in the Mojave region means that the project achieved one of its primary pedagogical goals, which was to enable students with the data- quantitative and qualitative- to better understand the issue and come to their own conclusions.

At the end of the day, the fact that the two student researchers completed the project with multiple conference presentations and awards under their belts is telling. As previously discussed, during the process both found the desire to attend graduate school, specifically in the project's related fields of geodesign and alternative energy. This speaks to the way in which self-directed, multidisciplinary projects can light a fire in students, motivating them to pursue environmental problem solving from a unique perspective.

We hope that this study can inform other researchers. The pedagogical approaches here—active learning, deep learning, multidisciplinary/interdisciplinary research—were effective in providing students with professional opportunities in the form of conference presentations and publications, as well as direction with respect to their own life choices. Further, both students better understood the ways in which solar siting is not just an issue related to aspect, slope, and radiation. Rather, human attitudes must be understood as a critical component of decision-making. Pedagogically, both students learned how to integrate technical approaches with attitudinal research. There remains much left to be done.

6. Recommendations for further research

There is ample room for future research. One critical component that was not executed was the interpolation of attitudes across space. While interpolation of

physical factors, such as elevation, have relatively straightforward approaches, interpolating attitudes is immensely more complicated to perform correctly. Further, interpolating attitudes across space, especially in rural areas, can result in erroneous interpretations. While this project did some basic mapping, much more work in this space is critical.

Also, it would be important to conduct a demographically representative survey. In a region where county sizes differ dramatically and population density is extremely variable, this type of data collection is complex. This would require substantive funding. But there is still work that could be done with the survey data that has already been collected. For one, attitudes towards industrial solar and residential solar should be analyzed separately, given that the interview data suggested that they may be inversely correlated. Second, basic factor analysis and Cronbach alpha reliability testing could be conducted on the survey question item responses. This would suggest what attitudes track together, thus enabling stakeholders to better understand how local respondents feel towards a suite of issues, rather than individually.

Another aspect of the project which did not come to fruition was participatory mapping by elected representatives on behalf of their stakeholders. This was conceived of as a proxy for surveying residents that would be much less expensive and easier to execute. While the student researcher sent out more than 150 emails, only one response was received. The reason for this is uncertain, but the researchers identified some possibilities. For one, represented officials have multiple demands on their time. Further, while clear directions as to how to use the participatory mapping project were given, there was a registration process that may have impeded participation. Also, some representatives may simply not be informed as to the attitudes of their constituencies with respect to solar development. All of these factors should be considered when attempting to investigate further questions about attitudes towards solar development in the future.
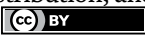
Author details

Jennifer Moore Bernstein[1]*, Cameron Audras[2], Charmaine Dalisay[1]
and Jennifer Swift[1]

1 Spatial Sciences Institute, Trousdale Parkway, Los Angeles, CA, United States

2 Bren School of Environmental Science and Management, University of California, Santa Barbara, CA, United States

*Address all correspondence to: janja.zupan@ffa.uni-lj.si

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Chapter 25

Inquiry-Based Fieldwork as Pedagogy for Exploring the World of Gendered Toys and Children's Clothes

Calvin Odhiambo

Abstract

Through the use of a class activity where students survey children's toy and clothing department stores, this chapter examines the use of inquiry-based fieldwork as pedagogy for exploring issues of gender socialization and gender inequality. This chapter starts with a discussion of the literature on inquiry-based teaching and learning, then it discusses how to conduct an effective inquiry-based fieldwork. This is followed by a description of an application of this pedagogy in an Introduction to Sociology class, including the procedures, findings, and analysis, then situates these observations and findings within the existing literature on inequality and learning. The paper then concludes with an evaluation of the effectiveness of this pedagogy, and suggestions to instructors who may consider using this pedagogy.

Keywords: gender, socialization, active learning, inquiry-based fieldwork, inequality

1. Introduction

When asked "What gender are you and why?", many undergraduate students answer the first part of the question by identifying themselves in gender binary terms of either male or female, suggesting that despite strides that have been made by the gay rights movement in the United States, the conceptualization of gender in binary terms is still very prevalent among a cross-section of the population.

With regards to the second part of the question, a majority of the responses students give relate to biological factors such as genetics, hormones, chromosomes, genitalia, etc. This is generally because most undergraduate students assume that gender differences are based wholly or mainly on biological factors – notions that reflect a naturalistic conceptualization of what it means to be human [1]. For the most part, these students have difficulty appreciating the role of the social environment or social structures on human development - a perspective that is at the core of sociology. To help students to critically evaluate these assumptions, instructors have a range of pedagogical strategies they can use. In more traditional settings, the instructor can choose to lecture as a way of covering content. Alternatively, instructors can engage in a collaborative learning process

where students can explore their interests, opinions, feelings, beliefs, and curiosity. In an Introduction to Sociology class, I employed the use of an inquiry-based fieldwork activity to help students appreciate the role of social structures in shaping who and what we are as human beings. The next section discusses the philosophical underpinning of inquiry-based fieldwork (IBF) strategies, and the benefits of the pedagogy. This is followed by a description of the activity I use in my class that applies the IBF strategy and concludes with an evaluation of this pedagogy.

2. What is inquiry-based fieldwork?

Inquiry-based fieldwork refers to the conduct of an investigative work at a field site to achieve particular student learning outcomes. It is an instructional practice where students are at the center of the learning experience and take ownership of their own learning by posing, investigating, and answering questions [2]. IBF is part of a wide array of student-centered teaching and learning approaches that make use of meaningful tasks such as cases, projects, and research to situate learning [3].

Inquiry-based learning is a teachnig strategy that finds its roots in constructivist learning theories, such as of Piaget [4], Dewey [5], and Vygotsky [6], among others. While constructivism itself can be traced back to Socrates and his emphasis on inquiry, the theory formally developed in the late nineteenth and early twentieth century with the work of John Dewey. According to constructivists, learning happens as individuals meaningfully construct an interpretation of how things work based on their own pre-existing structures. While Dewey understood that the need for organizing subject matter is an important component of formal education, he repeatedly addressed the need for the learner's personal involvement in exploration, which allows for deeper learning, or "seeking and finding" of one's own solutions [7]. Dewey believed that students should actively be in engaged in the learning process. According to Dewey, "if you have doubts about how learning happens, engage in sustained inquiry: study, ponder, consider alternative possibilities, and arrive at your belief grounded in evidence" [8]. Later theorists such as Piaget, Vygotsky, and Bruner connected the work of Dewey to research on cognition and advocated an educational environment in which students actively construct their own knowledge through inquiry and discovery, with guidance from their teachers.

Piaget emphasized the role of developmentally appropriate education and introduced the concept that as people learn, they either assimilate knowledge into their existing mental schemas, or they adjust their mental schemas to accept new knowledge through the process of accommodation [9]. Like Dewey and Piaget, Vygotsky believed that people create their own understanding by assimilating prior knowledge and new external influences. Further, Vygotsky argued that social interaction and critical thinking are two main ingredients of a learning process [10], and that mental development occurs when learners make meaning through the process of internalization, utilizing both external and internal interactions [11]. He described IBL as an "integral part of creating …. a social constructivist classroom" [12]. On his part, Bruner continued building on this research. He advocated discovery learning, which places the student in problem-solving situations requiring them to draw on past experiences, background knowledge, and existing knowledge to discover facts, relationships, and new information. Bruner argued that by emphasizing discovery, children are able to "learn the varieties of problem solving, of transforming information for better use", which enables children "to learn how to go about the very task of learning" [13]. Bruner believed that education must be made more

relevant to students' needs at each stage, and that teachers could accomplish this goal by allowing students to actively participate in the learning process [14].

A main difference between inquiry-based learning and traditional teaching and learning methods is that, instead of focusing on the teacher as the repository of knowledge and key to learning, IBL emphasizes the student's role in the learning process. Rather than the teacher telling students what they need to know, students are encouraged to explore the material, ask questions, and share ideas. It enables students to extract meaning from experience and to engage in life beyond the classroom, utilizing skills to gain a deeper understanding of themselves and the social world. Further, IBL uses different approaches to learning, including small-group discussion and guided learning. Instead of memorizing facts and material, students learn by doing, which allows them to build knowledge through exploration, experience, and discussion.

An instructor who chooses an inquiry-based teaching and learning can choose from a wide menu of hands-on or active learning strategies which include collaborative inquiry, such as learning and problem solving in small group settings; experiential learning, including direct experience in field settings; service learning, which are direct experiences that seek to solve problems and improve quality of life; integrative learning—generating links among previously unconnected areas; or research or inquiry-based fieldwork [15].

3. The benefits of inquiry-based fieldwork

Many studies have been conducted on the benefits of applying IBL in the classroom. For instance, Guido [16] identifies seven benefits of IBL, arguing that it: (a) reinforces curriculum content, 2) warms up the brain for learning, 3) promotes a deeper understanding of the content, 4) helps make learning rewarding, 5) builds initiative and self- direction, 6) works in almost any classroom, and 7) offers differentiated instruction. Guido examined inquiry from both a student and a teacher's point of view. He explained that from a student's perspective, IBL focuses on investigating an open question or problem, while from a teacher's perspective, inquiry-based teaching focuses on moving students beyond basic curiosity into the realms of critical thinking and understanding. Since IBL is student-focused and relies on students' own thinking and reasoning, the strategy also facilitates students' enjoyment and satisfaction in finding out for themselves something that they want to know, seeing for themselves what works rather than just being told, satisfying and at the same time stimulating curiosity about the world around them, and developing progressively more powerful ideas about the world around them [17]. Other studies have found that students involved in inquiry-based practices reported higher levels of academic self-efficacy, resolved conflicts at a higher rate, were less afraid to take risks, and more likely to continue trying different ways to be successful in areas where they previously failed [18].

Other studies have associated IBL with increase in critical thinking. For instance, Goldston et al. [19] argue that IBL considers the knowledge aspect of learning, yet places great emphasis on critical thinking, problem solving, and communication abilities. Similarly, Hwang and Chang [20] argue that when students learn by means of discovery and investigation in authentic settings, they improve their critical thinking skills.

According to Sockalingam, Rotgans, and Schmidt [21], when students are provided the opportunity to work on a problem, they gain new knowledge and further extend and deepen their current understanding. In addition, when students explore and investigate, they take responsibility for their learning, as they are expected to

make decisions and reach conclusions and judgments [22]. Thus, the students take agency over their learning. By being able to explore their own topics, make their own connections, and ask questions, students can learn more effectively.

In his video titled, 7 Skills Students Need for Their Future, Wagner [23] delivers a speech where he identifies a variety of skills needed for student success in a global economy. The seven skills are: critical thinking and problem solving; collaboration and leading with influence; agility and adaptability; initiative and entrepreneurialism; effective oral and written communication; accessing and analyzing information; curiosity and imagination. As Marks [24] explains, in an IBL classroom, students learn, practice, and reflect on these seven skills in an authentic process that imitates those processes used in the real world. Marks concludes that students who are actively engaged in inquiry do not only master content but master habits of the mind.

When done as an Inquiry-based Fieldwork (IBF), the pedagogy enables students to develop information gathering skills such as observation, analysis, interpretation, application etc. Students are actively involved and engaged in the fieldwork activity as they seek answers to the teacher-generated, or student-generated questions and draw their own conclusions [25]. Engaging in IBF enables students to go beyond knowledge acquisition to knowledge construction through questioning, collecting, organizing, analyzing, and interpreting data [26]. Through field investigation, students use their senses to make meaning and construct their knowledge by connecting their findings to their existing knowledge and creating new knowledge in the process. When the classroom is connected to the real world, it makes learning authentic, experiential, and relevant, creating a kind of "lived experience" which is critical in knowledge retention.

4. How to do inquiry-based research

According to John Dewey [8], field experiences are most likely to be academically and intellectually valid if they are carefully planned and monitored, structured to serve specific learning goals, and preceded by orientation and preparation. Students also need ongoing opportunities to reflect actively and critically on what they are learning from the field experience and to assess the results. Consequently, researchers have identified five stages or phases (also called the 5Es) for IBF [27]. These stages include Engagement, Exploration, Explanation, Elaboration, and Evaluation. What is included in each stage is discussed below.

Engagement. IBF involves sparking curiosity, which is the Engagement stage, or what Roberts [28] has called "creating the need to know". This is the pre-fieldwork preparation or planning stage where the instructor sets the stage for the fieldwork and provides the questions that need to be addressed in the field. This first stage is where inquiry questions are formulated. The instructor either provides pre-formulated questions or students engage in the process of constructing the questions. The instructor should ask whether each question is of such a nature as can be answered by following the planned data collection process. This is also the preparation phase. The goal here is to introduce concepts and pique students' interest.

Exploration. IBF involves gathering data, which is the second stage. Gathering data is done during the fieldwork itself. This stage involves locating the evidence, making observations, and collecting data. This is the stage where students carry out hands-on investigation which allows students to acquire a shared set of experiences that they can refer to help each other make sense of the concept under consideration. The fieldwork learning experiences should be structured around the inquiry question(s) and guiding

questions. The inquiry question is the overarching question that drives the fieldwork. It is usually an open-ended question and can be further divided into guiding questions.

Explanation: IBF involves answering the inquiry questions and guiding questions which is the third stage. Part of the value of IBF is collaboration and learning from each other. It is therefore critical that the instructor ask whether the inquiry questions allow student collaboration in small groups? Participants should be placed into small groups and required to collaborate in order to discuss the issues constantly, and to benefit from one another's experience and knowledge. To do this, each task needs to allow different possible answers, and to encourage students to compare their ideas. Students then report to the class. They show evidence for their answers and explain how they arrived at the answers.

The explanation phase focuses students' attention on a particular aspect of their engagement and exploration experiences and provides opportunities to demonstrate their conceptual understanding, process skills, or behaviors.

Extension (or **Elaboration**): This is fourth stage and where students are asked to apply their understanding to new situations, suggest implications or future applications or some social action. In this stage the instructor challenges and extends students' conceptual understanding and skills. Through new experiences, the students develop deeper and broader understanding, more information, and adequate skills. Students apply their understanding of the concept to everyday life. It is important for students to discuss and compare their ideas with each other during this phase.

Evaluation: IBF involves an evaluation or reflection, which is the fifth stage. This is where the instructor informally assesses the effectiveness of the fieldwork in meeting the objective of the class. Instructors can also evaluate student learning with a more formal assessment. This could be done through a test, a report, a presentation, or some other type of assessment. The evaluation phase provides students the opportunity to review and reflect on their own learning and to assess their understanding and abilities. This phase also provides opportunities for instructors to evaluate student progress toward achieving the educational objectives.

5. Application of inquiry-based fieldwork to the gender study

This section describes how I have applied IBF in an Introductory to Sociology class. First, I will describe the characteristics of the class in which this pedagogy has been applied. This is followed by a description of how this IBF activity follows the 5Es laid out in the previous section.

I teach at a mainly commuter, four-year university, where most introductory level classes have a maximum of 30 students (25 for online sections) and 25 for upper-level courses. In order to incorporate a lot of active learning in the classroom, my face-to-face classes typically meet twice a week and run for 75 minutes. Most of the classes have a mix of traditional students (generally between 18 and 21 years of age) and nontraditional students (generally students who are 25 years of age or older), with nontraditional students comprising about 40% of the overall student population. The racial composition of my introduction to sociology classes closely mirrors the racial composition of the freshmen enrolled at our university. Around 40% of my students are black, around 50% are white, and the remainder are divided between Hispanic (around 5%), Asian (around 2%), and others (around 3%). Most of the students who take Introduction to Sociology are freshmen, directly from high school, and who are either in very their first or second semester of college. As a result, most of these students come to the class with little if any prior sociological knowledge.

5.1 Engagement

As discussed in the previous section, this is the first stage of the inquiry-based fieldwork where I set the stage for the fieldwork. I use the Gender Study[1] activity in relation to the topic of Socialization. I start the topic by posing the question mentioned at the beginning of this chapter as a way of sparking student curiosity and give them an opportunity to make connections between what they know and the new ideas I am trying to have them learn. Following the exchange with students described in the Introduction section, I have students watch a portion of John Stossel's documentary, "Men, women, and the sex difference: Boys and girls are different." After a discussion of the main arguments of the documentary, I introduce the Gender Study activity and mention to the students that this activity will provide them evidence that contradicts the evidence provided by John Stossel's video.

As I explain to the class, the goal of the Gender Study is to enable students to understand how children learn to "do gender". In other words, how children learn to behave and present themselves in ways that make them easily viewed as male or female. By analyzing the gender makeup of children's toys and clothes, students will have a chance to see how gender socialization works in the real world.

In this activity, students are required to visit 1) a children's clothing store, and 2) a children's toy store to observe what the store sells for boys and what the store sell for girls.

5.2 Exploration

This is the second stage of the inquiry-based fieldwork where students actually collect data. Students typically visit stores that have both a children's clothing and toys departments or sections. Students make a list and describe items intended for boys or girls and if there are any gender-neutral or non-gendered items. In addition, students also observe how clothing and toys are arranged in the store(s) and address related questions such as, how do they know which items are intended for boys and which ones for girls? Students also need to make observations about any differences in the fabric, clothing textures, patterns, decorations, etc. on the clothes. With regards to the toys, students need to pay attention to and describe the kids of toys, colors, designs, etc. These observations are recorded in the Gender Study worksheet (see the appendix for details of the questions which students are given to guide their field observations). In my class, students visit the stores individually, at a time that works best for them. I have found this to be more practical than to try to organize a group field trip. Since most of my students commute to college and have different class and work schedules, it not practical to coordinate a common fieldwork time. Once the Gender Study Worksheet is filled out, students bring these to the next class in preparation for the 3rd stage - Explanation.

5.3 Explanation

When students bring back their completed Gender Study Worksheets during the next class, they are divided into groups of no more than 5 students each. Their first task is to choose a group leader who will lead them through the discussions in their groups and a recorder (who will record their answers). I then give each group four guiding questions. The first two questions relate to the explanation stage while the

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[1] This activity is adapted from Betsy Lucal's activity titled "Gender Socialization" that is described in detail in "Sociology Through Active Learning", edited by McKinney et al. 2001.

third question related to stage 4 and the last question, to stage 5. It is important to note that the questions are posed in increasing levels of complexity, starting with the lower-level thinking question which simply asks students to describe what they observed, to higher-level thinking questions like questions 3 and 4 which require students to engage in critical thinking and application.

To ensure that each group can adequately address all their guiding questions within the allotted time, I randomly assign half of the groups to focus only on toys in their discussions while the other half focuses only on clothes. Students are asked to answer the first three questions as a group but for each group member to answer the fourth question individually by writing their answer at the end of the Gender Study worksheet. Initially, the groups are asked these questions:

1. *Compare your findings. What patterns do you see? Describe any unusual or unexpected finding by anyone in your group.*

2. *What kinds of things do you think clothes or toys teach children about gender? How do they teach them to be boy or girl? Think about the kinds of clothes or toys intended for each gender and how the clothes might affect, for example, a child's movement or how the toys might affect, for instance, a child's interests.*

With regards to the first question, students usually observe that children's toys are divided by colors - mostly darker or primary colors in the boys' section and lighter or pastel colors in the girls' section. Further, boys' clothes are made of tougher fabric such as cotton while girls' clothing are more delicate. In addition, girls' clothes are more fitted and colorful while boys' clothes are buggier, and dull colors. With regards to toys, students usually observe that the toys are also separated by gender. In general, boys' toys comprise of action figures, cars, including police cars and fire trucks, guns, tool sets, athletic or sporting gear such as balls, skateboards, etc. On the other hand, the toys in the girls' section tend to be dolls, dress-up sets, cooking sets, nail sets, domestic appliances, stuffed animals, etc. Students observe that the clothing and toys are very gendered.

With regards to "unusual" or "unexpected" findings, students have generally made two observations. First is that some stores have a gender-neutral section for toys. Toys in this section include video games, swing sets, sand, or beach toys, and electronics, among others. However, students have not observed any store with a gender-neutral clothing section. The second observation is that some clothing items in the girls' section look like some of the clothing items in the boys' section, but there are no clothing items in the boys' section that look "girly".

In response to the second question, students observe that through toys, society teaches girls to be "girly" – more feminine, use make-up, strive to look beautiful, do more domestic labor such as household chores, and be caregivers, while boys are encouraged to be the "fixers" of anything broken. In addition, males are supposed to engage in professions or occupations that put them outside of the house, like being in the military, police, fire fighting, or in construction work, and to be more hands-on. In addition, boys are also expected to exhibit strength like superheroes, and to be caretakers, providers, protectors, and builders.

With regards to clothing, students observe that, in general, girls' clothes suggest that they are supposed to be gentle, be graceful, elegant, and proper, stay inside the house, and be clean, while boys, given the darker colors of their clothes and stronger fabric, are being told by society that they can be rough, play outside, get dirty and move faster, since most of their clothing fit loosely and allow more mobility. In

general, students recognize that children's clothes and toys are a way in which society sets out different gender role expectations.

5.4 Extension/elaboration

This is the fourth stage of the Inquiry-based fieldwork and where students are asked to apply their findings and to extend their conceptual understanding. Students are given the guiding question as follows:

3. *If you are being sociologically mindful, these findings have to be taken a step further. We cannot stop with the patterns. We have to think about what they might mean and how these patterns connect to other aspects of the social world. Gender is not just a matter of differences between groups of people. Gender, in our society, is a basis for inequality - for assigning people different roles, rewards, responsibilities, privileges, and so on. Discuss how children's toys or clothes can perpetuate (or maintain) this form of inequality.*

The extension/elaboration question is usually initially challenging to students, mainly because of the higher-level thinking that it requires. However, after they seek clarification on what the question is asking and some examples, they are usually able to identify several points. First, students acknowledge that the gendered toys and clothing helps to perpetuate gender stereotypes. As one group puts it, *toys help to keep stereotypes alive...*". What this point indicates is that students are able to see that, for instance, when society walls off the toys and say that "these are only for boys" or "these are only for girls", it essentially limits opportunities for one gender while expanding it for the other gender. Relatedly, students are able to acknowledge that by setting different gender role expectations through toys and children's clothing, society affects the jobs that males and females will have in society and the roles they will play. For instance, one groups states that *"Boys are brought up to play roles and have jobs in the more aggressive fields... Girls are raised to play roles and have jobs that cause them to be sensitive, like housework or cleaning or being a babysitter..."* In a related point, another group states that *"the toys that children play with can determine what occupation they take on when they are older, such as a boy can play with cop cars and grow up to become a cop while a girl could play with nail sets and become a cosmetologist. There is inequality in the toys that girls and guys are given because the guys are more encouraged to go into the workforce while girls have to be homemakers and often have to go against the society's standards to work outside the house"*. Some of the groups add that our society gives little or no money to people who do housework while giving a lot of money to people who work outside of the home.

Since the students may not have been exposed to relevant literature, as the groups share their analysis in class, I point out that research has shown that different toys help children to develop different kinds of skills. For instance, children who play with construction toys or toys relating with technology, develop spatial skills that will make them gravitate toward science, technology, engineering, medicine, etc. If, as students observe, most of these toys tend to be in the boys' sections, it helps to explain why in our society these professions, which are some of the best paid professions, are dominated by men. Thus, the gendered toys and clothing that many take as a natural part of society becomes a means for perpetuating gender inequality. Boys are steered into more "masculine" occupations, which just happen to be the more highly paid occupations, while girls are steered into more "feminine" and less highly paid occupations. This suggests that the toys and clothes that children receive during their formative years are intricately intertwined with the gender inequalities observed in society.

5.5 Evaluation

This is the fifth, and final, stage of the Inquiry-based fieldwork and where the instructor evaluates or assesses the extent to which this activity met the objectives of the class. In my Introduction to Sociology class, the evaluation is done by asking students to individually respond to the fourth guiding question.

6. What did you learn about socialization from this activity? Give specific examples to support your answer

Since, as discussed at the beginning of this chapter, most introductory level undergraduate students assume that gender differences are based wholly or mainly on biological factors, I am often curious to see how this IBF activity influences perceptions and expands their knowledge about socialization. To gauge individual students' understanding, I ask students to complete this question individually.

Based on responses from the students, the effect of this IBF activity on their perception about socialization is always very clear. In general, students are able to make connections between toys and clothing and socialization. For instance, a student states "*What I learned is that girls and boys are taught from an early age how to interact, what to do...etc., all dealing with socialization. Girls learn from toys and easy bake ovens to be good homemakers. Guys learn to like sports and outdoor activities...*" Another student states "*I learned that children learn how to assume the role of male or female from toys and clothes. For example, a girl playing in a toy house with appliances learns to assume the role of the typical female by taking care of the house. On the other hand, a boy playing with cars and superheroes learns to be strong and confident*". The idea that children's clothing and toys influence who they will be in the future is a thought that came cross clearly in the students' comments. For instance, another student commented that "*from this group exercise, I learned that the toys children play with when they are little could lead to their occupation when they are grown...*". This comment is referring to the concept of anticipatory socialization which occurs when people take on the values and standards of groups that they aspire to join, to ease their entry into the group. Clearly, these children are involved in anticipatory socialization through the toys and clothing as they learn the norms and role expectations they will be required to evince when they are older.

Other students recognized the societal influence on socialization. For instance, one student stated that "*Society has a major effect on how boys and girls become masculine and feminine*". Another student stated that they learned that "*society has a big impact on how different males and females have to be...*". This is important, considering the naturalistic conceptualizations of what it means to be a human being, that many undergraduate students come to college with. The acknowledgement that society plays a major role in what it means to be feminine or masculine reflects a major shift in perceptions.

Still, other students acknowledge the fact that socialization starts early in the life of human beings. For instance, one student states that they have learned that "*Socialization starts at an early age...*". Another student states that "*from this group exercise, I have learned that socialization starts with childhood influences from clothes and toys...*".

7. Discussion

The direct comments from students suggest that students did not only understand how children learn to "do gender", but also comprehended how gender and socialization

work in real world. During semesters that I have not assigned a final exam in the Introductory to Sociology class, I have assigned a final reflection paper. Part of this assessment requires students to identify two activities we have done through this class which have left a lasting impression in their mind. The Gender Study is one of the activities that students identify as leaving a lasting impression in their mind. Considering that the final reflection paper comes at the very end of a 16-week semester, yet the topic of socialization is usually discussed around the third week of classes, the fact that students are able to identify the Gender Study activity at the end of the semester shows how an active learning activity such as this inquiry-based fieldwork can create a "lived experience" which is critical for knowledge retention. The fact that this activity provides students with real-world experience with a classroom subject matter greatly helps to reify the concept of gender socialization in the minds of the students, to fostering long-term learning, improve knowledge retention, and increase student engagement. To extend Ghomal [29], with inquiry-based fieldwork, students are engaged in the learning process and are making sense of the world around them. Clearly, the students in the Gender Study are making sense of the world of children's toys and clothes in ways that would not have been possible through the use of a traditional lecture.

A value of an Inquiry-based fieldwork activity such as the Gender Study is also that students are not just students, but also researchers. They are creating their own knowledge by making observations and engaging in deductive thinking to reflect on or analyze the findings. Being able to reason from the children's toys and clothing to differences in men's and women's occupations and to gender roles is a classic example of deductive thinking and critical thinking that should be the intended goal of any meaningful education.

Beyond inculcating research skills, this inquiry-based fieldwork also improves student engagement, promotes teamwork, and caters to different students' learning styles. This method has been described as "an alternate approach to pedagogy which is more socially equitable, which recognizes that there are differences in backgrounds, preparation, and knowledge among students, and capitalizes on individual and diverse opinions" [30]. What Summerlee is pointing out here is the fact that the lecture method of teaching targets a certain group of students, while leaving behind those students have different learning styles. In the classroom, one way in which this becomes manifest is that student participation increases greatly during the week when we do this activity. Even students who are usually more reticent to speak in class "find their voice".

In spite of its high success, careful planning is critical to the success of fieldwork. Instructors planning to use this pedagogy should pay careful attention to the four major stages required in planning, including 1) pre-fieldwork stage, 2) the fieldwork stage, 3) the post-fieldwork stage, and 4) the evaluation stage. Since Section 5 of this chapter provides details that correspond to these stages of preparation, I will only provide additional thoughts relating to the pre-fieldwork stage.

The pre-fieldwork stage is where background research and reconnaissance of the field site become important. Among things to consider in this stage would be risk-assessment to ensure student safety. The alignment of the learning objectives to the syllabus goals is crucial. This is also the stage for constructing the guiding questions which can either be teacher-generated or student-generated. Since in my class, students go to the fieldwork at their individual times, there is no need to try to coordinate a common time for the visit. Since the observation is supposed to be unobtrusive, I have not found a need to reach out to the store to seek permission for the visit. However, other instructors may wish to seek permission from the store management to enable students to freely make notes without fear. Still, the instructor should also be prepared for the likelihood that the store management will decline, especially if the taking of notes is

misconstrued for something else. In my class, I remind students to be careful to take the notes surreptitiously and be ready to politely explain to any store associates or management if asked. Students also know to comply with any requests to not take any notes at the store if the store management opposes notetaking, for whatever reason. In that case, I encourage students to record their observations as soon as they exit the store(s).

8. Conclusion

Field based pedagogy is common in fields such as earth science, ecology, environmental science, archeology, geology, geography, biology, and other natural sciences, where students work "in the field" to observe and collect materials needed for learning. However, this pedagogy is not very well developed or utilized in the social sciences and other disciplines where much of the learning occurs in a classroom, laboratory, library, or computer room. As this chapter has demonstrated, inquiry-based fieldwork incorporates several aspects of active learning pedagogy which has been associated with effective teaching and learning. While this chapter understands that there is a place for a good and interactive lecture in dissemination of learning, inquiry-based teaching and learning ranks higher than traditional lecture in terms of its effectiveness as a method of instruction.

Conflict of interest

The authors declare no conflict of interest.

Appendix

SOCY 101: INTRODUCTION TO SOCIOLOGY
GENDER STUDY WORKSHEET
Due in class on Tuesday, October 22
Instructions: Print and fill out both Part I and Part II of this worksheet to record your observations when you visit a children's clothing and toy department store to observe what the store is selling for the different sexes. Create appropriate spaces in between the questions as you need to adequately address the questions.
Your name_____
Name of the store(s) you observed_____
PART I: CLOTHES
Can you tell which clothes are for girls versus boys? If 'yes' how?
Pay particular attention to and describe:

a. the items of clothing offered for:

BOYS:
GIRLS:

b. the fabrics/clothing textures used for:

BOYS:
GIRLS:

c. the patterns/decorations used for:

BOYS:
GIRLS:

d. any other differences between clothes for,

BOYS:
GIRLS:

Are there any gender-neutral clothes (in other words, clothes that appear to be for both boys and girls)?
Describe them:

PART II: TOYS.
Can you tell which toys are for girls versus boys? If 'yes' how?
Pay particular attention to and describe...

a. the kinds of toys offered:

BOYS:
GIRLS:

b. the colors, designs (etc.) of toys meant for:

BOYS:
GIRLS:

c. any other differences between toys for:

BOYS:
GIRLS:

Are there any gender-neutral toys (in other words, toys that appear to be intended for both boys and girls)?
Describe them:

Author details

Calvin Odhiambo
University of South Carolina Upstate, Spartanburg, South Carolina, United States

*Address all correspondence to: codhiambo@uscupstate.edu

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Chapter 26

Coeducation in Higher Education of Afghanistan: Students' Perspective

Sayeed Naqibullah Orfan and Ebtisam Niazi

Abstract

The study investigated Afghan undergraduate students' perceptions of positive and negative effects of coeducation. It also examined the impact of students' gender and ethnicity on their perceptions. A survey questionnaire was used to collect data from 230 randomly selected students from Takhar University. The authors utilized descriptive and inferential statistics to analyze the data. The results showed that students had positive attitudes towards coeducation. They believed that coeducation had both personal and social effects such as improving students' academic confidence, communication skills, preparing them for real life, promoting gender equality and reducing gender biases and stereotypes. However, less than half of students believed that coeducation had negative effects, e.g., distracting students and male students' domination of class activities. Moreover, the findings revealed that students' gender had a significant impact on their responses; female students' attitude towards coeducation was stronger than that of male students. However, students' ethnicity did not significantly impact their responses.

Keywords: Coeducation, gender equality, effects, attitudes, learning environment

1. Introduction

Coeducation (also known as mixed-gender or mixed-sex education) is a system of education that allows both girls and boys to study together in the same setting under the same conditions and equally share resources, facilities and experiences of a school [1–4]. In the late 19th and early 20th centuries, many coeducational schools were established in North America, Russia and some European countries such as Germany and Britain [5–7]. Since then, the concept of coeducation has traveled around the world and the vast majority of schools and universities are mixed-gender [8, 9]. Knight [10] asserts that many educational institutions around the world adopted coeducation because of the public pressure and advocates of equal rights of girls to education. There were oppositions against coeducation in some Latin American and many Islamic countries, but soon they gave way to coeducation. There are still conservative and traditional communities in countries that oppose coeducation, which mainly roots from their traditional beliefs and cultural norms [11, 12]. For instance,

coeducation is completely banned in North West of Pakistan where women have no social status and political power [11, 13, 14].

Implementation of coeducation in Afghanistan has been heavily dependent on political situation and ruling faction. Coeducation in Afghanistan dates back to the 1920s during which Amanullah Khan was ruling the country, and he is thought to have relentlessly attempted to modernize the country and promote gender equality in the country. During his reign in 1928, the first co-educational classes were introduced at Amaniyya High School for grades one and two [15]. Coeducation was introduced at the university level in the late 1970s during which People's Democratic Party of Afghanistan (PDPA), a Soviet-backed party rose to power. PDPA implemented rapid social and economic changes and introduced mass literacy for women and men of all ages. They reformed the education system and stressed education for both women and men. Numerous decrees aimed to ensure equal rights for women were issued. A large percentage of women obtained their higher education and worked as doctors, faculty members and MPs [16, 17].

However, the Soviet invasion of Afghanistan in 1979 and civil wars destroyed the education system. Women's access to higher education was severely curtailed following the collapse of the communist regime and rise of the Mujahedeen to power in 1992. During their era (1992–1996), women's movement was restricted and access to higher education became limited particularly for women [18]. The situation became worse under the Taliban Regime (1996–2001). They outlawed coeducation in the country [16]. They barred girls from going to school let alone attending universities and studying along with boys under a roof [19–21].

Following the US attack to Afghanistan and the collapse of Taliban Regime in 2001, public universities reopened their doors for girls and boys and new public and private higher education institutions were established. Girls and women were encouraged to matriculate at these universities through konkor exams (national entrance exams) [18]. Since 2001, the country has made significant progress with respect to gender equality particularly women's education [22]. The classes in public and private higher education institutions are coeducational with the exception of schools of Sharia at the universities in which female and male classes are separated. Furthermore, female and male classes are separated particularly in remote provinces by a few departments of some faculties when there is enough number of girls to offer female-exclusive class. Some public schools particularly primary ones are coeducational in various parts of the country. Moreover, some private schools especially the ones based in big cities (e.g., Kabul) offer coeducational classes at high school level. Teacher training colleges, community colleges and vocational institutes also offer coeducational classes. Many foreign language centers in particular English language centers offer coeducational classes even the ones based in remote cities (e.g., Taliqan City). However, all female and male classes in madrassas (religious schools) are separated.

Scholars are of various views with respect to coeducation and its effects on students. According to Evans [23], coeducation is more conductive to gender equality; it results in undermining gender stereotypes as girls reveal equal competences in mixed-gender classes. Coeducation is believed to play a vital role in the social development of girls and boys. They gain social maturity through interaction with each other and sharing personal experiences [11]. Mixed-gender education provides girls and boys with the opportunity to see each other as partners in learning. It offers a wide variety of learning experiences and role models, and it promotes equality and diversity. As girls and boys study and work together in the same environment under the same conditions, they improve their social and emotional understanding. In a coed setting,

they learn to treat each other with respect and reject the gender stereotypes associated with a particular gender [24]. Schmuck [25] states that mixed-gender education helps boys and girls to develop effective interpersonal skills, which are essential for their social life and success in their workplace.

On the other hand, other scholars have disfavored coeducation. Bosire et al. [26] assert that female students' academic performance is negatively affected in a coed setting since they may be exposed to subtle discriminatory pedagogical practices, and in some cases they experience verbal and sexual harassment by male students. According to Signorella et al. [27], in coed classes, male students receive more attention than girls because they behave disruptively in the class compared to female students who are considered quieter and well-behaved. In coeducation, female students are likely to worry that their being assertive in the classroom or outside make them feel less attractive [28]. Francis [29] argues that male students dominate interaction in coed classrooms and hands-on activities in the learning process. According to O'Reilly and Mottet [30], cases of indiscipline such as bullying, stealing, absenteeism, sneaking and defiance of authority are more widespread in coeducational environment compared to single-sex education. Some scholars [31–33] have argued that that coeducation is risky for girls since they are marginalized and belittled in coed classes. Some researchers [34–37] concluded that girls studying in single-sex schools were more successful than those studying in coeducational schools.

A very small number of studies investigated students' perception of coeducation particularly that of the undergraduate students. Kachero [24] investigated students' and teachers' perceptions about effects of coeducation on academic performance in secondary schools in Kenya. The author concluded that students and teachers had negative attitudes towards coeducation. High level of indiscipline, male students' uncivil behaviors, teachers' preference of male students to female students' and encouragement of girl-boy relationship accounted for students' and teachers' ones negative attitudes. Payne & Newton [38] investigated teachers' and students' perceptions of mixed-gender secondary schooling. The findings showed that both teachers and students perceived coeducation to be most advantageous for students when it came to preparing them for future occupational and interpersonal roles. Rennie and Parker [39] studied students' and teachers' perceptions of single sex and mixed-sex mathematics classes. The participants believed that single-sex classes provided a more supportive environment for girls but a less supported environment for boys. Khalil et al. [40] concluded that female students in mixed-sex institutions had higher self-esteem than those in single-sex education. However, some studies [41–43] comparing the effects of single-sex and mixed-sex education concluded that there were statistically significant differences between them when it came to their effects on students. Alanazy [44] found that Saudi students, who were studying in the USA, had positive attitudes towards learning in coeducational environment while Alsaif [45] concluded that Saudi students, who were studying in the west at the time of the study, preferred single-sex education. Alsiaf also found out that female students were more receptive to coeducation than male students.

Afghanistan is one of the poorest countries in the world and traditional and cultural values and norms especially with respect to women are still prevalent in many of its parts. Interaction between women and men is considered a taboo particularly in remote areas. As far as the authors are concerned, no studies have been conducted to investigate the status of coeducation, students', instructors' and the general public views about coeducation at school and higher education levels. The current study is an

attempt to investigate Afghan undergraduate students' perceptions of coeducation. It explores students' attitudes towards coeducation and their views about positive and negative effects of coeducation. Furthermore, it examines the impact of students' gender and ethnicity on their responses.

2. Methods

2.1 Participants

The participants of the study were 230 undergraduate students who were majoring in different fields at Takhar University located in Takhar, a northeastern province of Afghanistan. They were between 18 and 26 years old at the time of the study. Around 36% (82) of the participants were female while 64% (148) were male. Most of the participants (67%) of the participants were Tajik followed by Uzbek participants (21%). Pashtuns formed around 10% of the participants while a small percentage (3%) of the participants were Hazara.

2.2 Instrument

The authors used a survey questionnaire to collect data for the study. The questionnaire was developed after conducting focus group discussions and literature review. The researchers conducted focus group discussions with 10 students to identify questionnaire items. They discussed the positive and negative effects of coeducation and made a list of them. The authors developed 15 items of the questionnaire from the focus group discussions. They adapted 9 items from other studies [24, 39, 46, 47]. The questionnaire consisted of three sections. The first part sought the respondents' demographic information, i.e., gender, age, and ethnicity. The second part consisted of 14 items that aimed to elicit the participants' response about their attitudes towards coeducation and its positive effects. The third part with 10 items inquired the participants' views about negative effects of mixed-sex education. They were required to respond to the questionnaire items on a four Point-Likert scale (Strongly disagree = 1, Disagree = 2, Agree = 3, Strongly agree = 4).

The authors conducted a pilot test with 10 purposely selected students with English proficiency from Takhar University to measure the reliability of the questionnaire items and ensure their consistency. They were required to respond to 24 items on a 4-point Likert Scale. The reliability analysis was carried out on SPSS version 26.0. The results demonstrated that the value of Cronbach's alpha is over 0.85 coefficient for each section (**Table 1**), which indicates high internal consistency of the items in each section. Thus, the items were considered appropriate for the study. The questionnaire was translated into Dari (the lingua franca of Afghanistan) since English is a foreign language and many people cannot speak English in Afghanistan [48, 49]. The Dari questionnaire was given

Category	Number of Items	Cronbach's alpha
Positive effects	14	0.868
Negative effects	10	0.855

Table 1.
Reliability value of questionnaire items.

to three faculty members in the Dari Department for improvement and the problematic items were identified and revised based on their comments.

2.3 Procedure and analysis

The authors collected data from 230 randomly selected students who were majoring in different fields at seven faculties at Takhar University. They wrote the names of classes in each faculty and picked two classes from a bowl. Using each class's attendance sheet, the authors selected 18 students; they selected every other student. They explained the study and its purposes to the participants in seven sessions in prearranged times and places. They were required to read and sign a consent letter, which aimed to ensure them that their participation was voluntary and their responses were confidential. They were requested to read the instruction for each section and respond to the items accordingly. The authors encouraged them to inquire about any unclear items in the questionnaire.

The authors closely examined the questionnaires to ensure that the participants completed them appropriately. They discarded 20 questionnaires since they were completed inappropriately. They numerically coded the data in an excel spread sheet and imported them to SPSS version 26.0 for analysis. The authors used descriptive statistics to determine the frequency, mean and stand deviation of the data. Furthermore, they used inferential statistics such as Independent Samples *T*-test and One-Way ANOVA test to examine the differences between participants' responses by their gender and ethnicity.

3. Results

3.1 Overall attitude

The authors conducted descriptive statistics to determine the overall attitude of students towards coeducation. The overall mean score of students' attitude is around 3, which means that they have a positive attitude towards coeducation. The authors divided views of students about the effects of coeducation into two categories.

3.1.1 Personal effects of coeducation

The participants stated that coeducation had positive impact on students. Over 84% believed that coeducation improved female and male students' academic confidence, communication skills, and motivation for study (**Table 2**). Moreover, over 83% agreed and strongly agreed that coeducation would improve students' confidence to speak in the presence of the opposite sex, help them do away with their shyness and prepare them for real life situations. Around 76% and 77% stated that coeducation exposed students to various viewpoints and facilitated positive competition between female and male students.

3.1.2 Social effects of coeducation

The participants believed that coeducation had positive social effects. As **Table 3** shows, over 83% agreed and strongly agreed that coeducation promoted girls' and boys' socialization and promoted mutual respect between them. Around 74% and 79% stated

No	Statement	Mean	% of A & SA
1	It Improves academic confidence of female and male students.	3.11	83.5
2	It improves students' communication skills.	3.11	84.8
3	It Improves students' confidence to express their views in the presence of the opposite sex.	3.23	86.1
4	It helps students get rid of their shyness.	3.22	83.9
5	it increases students' motivation for more efforts in their study.	3.29	86.5
6	It prepares students for real world.	3.14	83.5
7	It facilitates positive competition between female and male students.	2.91	77.4
8	Students are exposed to different viewpoints.	2.91	75.7
A = agree, SA = strongly agree.			

Table 2.
Students' view of personal effects of coeducation.

No	Statement	Mean	% of A & SA
9	It promotes girls' and boys' socialization.	3.16	86.5
10	It promotes a mutual respect between girls and boys.	3.14	83.5
11	It helps reduce gender biases and stereotypes.	2.9	73.5
12	It improves girls' and boys' understanding of each other.	2.96	78.7
13	It promotes gender equality.	2.62	61.3
14	It reduces education cost.	2.55	54.8

Table 3.
Students' view of social effects of coeducation.

that coeducation would help reduce gender biases and improve girls' and boys' understanding of each other, respectively. Furthermore, most of the participants believed that coeducation promoted gender equality (61%) and reduced education cost (55%).

3.2 Negative effects of coeducation

The authors utilized descriptive statistics to determine the participants' views about negative effects of coeducation. As **Table 4** shows, 43% stated that coeducation would result in students' distraction and they would not feel comfortable sharing their ideas in front of the opposite sex. Similarly, 42% of the participants stated that coeducation would not meet students' various needs. 40% believed that students would not ask questions openly in front of the opposite sex and boys always dominate the activities in the class. More than a quarter of the respondents (36%) believed that coeducation would lead to illegal relationships between girls and boys. Around 30% and 33% agreed and strongly agreed that students would not be active in the learning process and work well in mixed-sex groups, respectively. A small percentage of the respondents stated that coeducation would result in poor academic performance (24%) and girls' lack of self-esteem and confidence (20%).

No	Statement	Mean	% A & SA
1	It results in students' distraction.	2.38	43.2
2	Students do not feel comfortable with sharing their ideas in the presence of the opposite sex.	2.31	43
3	It will not meet the various needs of girls and boys since they are different.	2.3	42.2
4	Students cannot ask their questions openly in presence of the opposite sex.	2.3	40.4
5	Boys dominate the class activities.	2.32	39.6
6	It leads to illegal relationships between girls and boys.	2.2	36.1
7	Students do not work well in mixed gender groups.	2.12	33
8	Students will not be active in the learning process since girls and boys are not willing to interact with each other.	2.12	29.6
9	It results in poor academic performance of students.	1.98	23.9
10	Girls demonstrate a lack of self-esteem and self-confidence.	1.83	20

Table 4.
Students' views of negative effects of coeducation.

3.3 Participants' demographic profile

The authors utilized Independent Samples *T*-test to examine the differences between participants' responses by their gender. As **Table 5** shows, the p-value (0.000) for gender is less than the alpha level (0.05), which indicates that the participants' gender had a significant impact on their responses. That is, female students (M = 3.17) had a stronger positive attitude than male students (M = 2.85) towards coeducation. Compared to male students, they believed that coeducation was more advantageous. Furthermore, One-Way ANOVA test was run to determine the differences between participants' responses by their ethnicity. The p-value (0.423) for ethnicity is greater than the alpha level (0.05). Therefore, it is concluded that the participants' ethnicity did not have a significant impact on their responses.

In addition, Independent Sample *T*-test and One-Way ANOVA test were used to examine the differences between the participants' views of negative effects of coeducation. The high mean indicates that the participants believe that coeducation

Category		N	Mean	SD	P-value
Gender	Female	82	3.17	0.4015	0.000
	Male	148	2.85	0.59961	
Ethnicity	Hazara	5	3.13	0.73955	0.423
	Pashtun	20	2.94	0.64859	
	Tajik	153	2.96	0.53907	
	Uzbek	44	2.93	0.56272	

Table 5.
Positive effects of coeducation by gender and ethnicity.

Category		N	Mean	SD	P-value
Gender	Female	82	1.9	0.46001	0.000
	Male	148	2.35	0.65314	
Ethnicity	Hazara	5	1.78	0.40866	0.338
	Pashtun	20	2.245	0.75217	
	Tajik	153	2.1837	0.61905	
	Uzbek	44	2.2023	0.63922	

Table 6.
Negative effects of coeducation by gender and ethnicity.

has more negative effects. As **Table 6** shows, the p-value (0.000) for gender is less than the alpha level (0.05), which indicates significant difference. Compared to male students (M = 2.35), female students (M = 1.9) believed that coeducation had little or no negative effects. The p-value for ethnicity is 0.338, which is greater than the alpha level (0.05). Thus, it is concluded that the participants of different ethnicities have similar views about negative effects of coeducation.

4. Discussion

The study investigated Afghan undergraduate students' perceptions of coeducation. The findings showed that students had positive attitudes towards coeducation. it can be accounted for by the fact that coeducational classes are almost the only place where Afghan girls and boys have the opportunity to interact with one another and exchange ideas. The vast majority of students experience their first interaction with their female and male peers in coeducational classes. It corroborates the finding of the studies by Payne & Newton [38] and Alanazy [44] who reported that students held positive attitudes towards coeducation. It also supported the findings of the study by Hong et al. [50] who reported that students in coeducational classes had more positive attitudes and higher interests than those in single-sex classes. However, it contradicts those of the studies by Kachero [24] and Rennie and Parker [39] who found out that both teachers and students had negative attitudes towards coeducation and they preferred single-sex classes.

The vast majority of students believed that coeducation had a variety of personal effects. They stated that coeducation would improve students' academic confidence, communication skills, confidence to speak in the presence of the opposite sex, and enhance their motivation for further study. They also believed that coeducation would reduce students' shyness, expose them to different ideas, facilitate positive competition between them and prepare them for real-life. Similarly, they believed that coeducation would bring about social effects such as promoting mutual respect between women and men and gender equality, reducing education cost, facilitating girls' and boys' socialization, boosting girls' and boys' understanding of each other and reducing gender biases and stereotypes. The fact that Afghan girls and boys meet and talk with one another in coeducational classes and learn to treat one another as unique individuals can be the major reason why they believe that coeducation is of a wide variety of positive effects.

However, less than half of the participants believed that coeducation had negative effects. They believed that coeducation would distract students, would not

meet their various needs, result in students' poor academic performance and male students' domination of class activities. This finding corroborates that of the study by McKenzie et al. [51] who reported that male students' interruption of female students in coeducational classes affected their learning and performance. Furthermore, they stated that coeducation paved the way for illegal relationship between girls and boys. It is on a par with the study by Achoka [52] who concluded that early relationship and marriage increased in coeducational environment. The participants also believed that students did not feel comfortable to share their ideas and ask questions openly in the presence of the opposite sex. This finding is consistent with that of the study by Younger and Warrington [53] and Narwana & Rathee [54]. Students also believed that coeducation would result in inactivity in the learning process and mixed-sex groups and female students' lack of self-esteem and confidence.

A number of reasons can account for these views. Afghanistan is a patriarchal society, which greatly affects interaction in coeducational classes where more attention is paid to male students than female ones. Moreover, the vast majority of lecturers in Afghan universities are male who may prefer male students' voices than female ones and may give more chances to male students to speak in the class. Teacher-centered approaches and methods are very widespread in Afghan higher education institutions that rarely address students' various needs [55]. Some lecturers discourage interaction between girls and boys in coeducational classes, and some lecturers form pseudo-cooperative learning groups made up of girls and boys, but rarely encourage cooperation between female and male students.

The results showed that students gender had a significant impact on their responses. That is, female students' attitude towards coeducation was stronger than that of male students. Compared to male students, female students perceived coeducation to be of more positive effects and fewer negative impacts. This finding is in line with that of the study by Alsaif [45] who reported that female students were more receptive to coeducation than male students. On the other hand, students' ethnicity did not have a significant impact on their responses. In other words, Tajik, Uzbek, Hazara and Pashtun participants were of similar views about coeducation.

5. Conclusion

The results showed that the Afghan undergraduate students had a positive attitude towards coeducation. The vast majority of students believed that coeducation had a wide variety of personal and social effects such as improving students' academic confidence, communication skills, preparing them for real life, promoting gender equality and reducing gender biases and stereotypes. However, less than half of the participants perceived coeducation to be of negative effects, e.g., distracting students and male students' domination of class activities. The study revealed that students' gender had a significant impact on their attitudes towards coeducation. The students' ethnicity did not significantly impact their views of positive and negative effects of coeducation.

Positive attitudes towards the learning environment are essential and help students maximize their learning and become lifelong learners [56]. Given the findings of the current study, the authors recommend the Ministry of Higher Education – the managing and policy making body of the Afghan government – to require all higher education institutions to change their single-sex classes to mixed-gender ones after a thorough investigation of other stakeholders' perspectives, i.e., lecturers, students,

administrators and the public. The authors suggest further studies on coeducation in the context of Afghanistan. They should employ a larger sample from various public and private higher education institutions. Besides survey questionnaires, interviews with students and teachers as well as observations in classes should be used to gain more insights about how students and teachers feel about coeducation. Moreover, studies to find ways to minimize negative effects of coeducation and maximize students' experiences in coed environments are recommended. In order to minimize negative effects of coeducation, authors suggest Afghan university lecturers to create a learning environment that ensures equal engagement of both female and male students in the learning process and encourage them to work together to maximize their learning.

Author details

Sayeed Naqibullah Orfan* and Ebtisam Niazi
Takar University, Taliqan City, Afghanistan

*Address all correspondence to: sayeed.naqibullah@fulbrightmail.org

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Promotion of Science Learning through Science Content and Practical Assessment

Nomxolisi Mtsi, Shakespear M. Chiphambo and Nomaroma Kumanda

Abstract

Assessment is an integral part of the learning and teaching. Trends in International Mathematics and Science report reveals that in South Africa, grade 9 has the worst science skills. The objective of the study is to explore if teachers can promote science learning through science content and practical assessment. The descriptive survey design was utilized in the study. The study was informed by Vygotsky's social constructivism. Thirty out of sixty-seven schools were selected using simple random sampling. Cronbach's alpha test was used to ascertain the scale reliability of the questionnaire. The findings revealed the following: Data illustrates how educators assess Science Learning. Responses were agreed, neutral, disagree, and no response. Align with cognitive domains 86.7%; Principles of assessment 77%; Investigations 66.7%; Simulation 63.3%; Debates 50%; each among these: Assignment, Experiments, and Examinations 40%; Problem Solving 37%; Projects 34%; Presentation 23%; Roleplay 17%; Tests 13.3%; and Quiz 7%. Regarding Neutral, data validates that teachers need support as well as those who disagreed they lack content knowledge regarding strategies of assessment. We recommend teachers to value assessment and implement different strategies of assessment so that students can be able to apply both theory and the practical.

1. Introduction

Learning and teaching are one of the core businesses in the learning organization; hence, teachers are expected to be more knowledgeable about the content. The content to be learned needs to be approached using the relevant instructional methodologies that will enhance interactive learning. Once the student understands the content, an assessment can be implemented to see whether the objectives of the lesson are met. Luckett and Sutherland [1] note that assessment is the core of a student's understanding, and to understand the knowledge, it needs to be measured using different approaches. The present researchers view assessment as the gathering of information, applying different assessment tools to enhance deep learning, and doing self-evaluation to come up with positive interventions. Assessment needs to be transparent and authentic and [2] explain

that to be transparent means to be clearly understood by students (unpack content clearly and let students participate). The literature notes that Education for Sustainable Development (ESD) aims at encouraging science-literate societies to be able to make conversant decisions regarding the natural environment and the promotion of sustainable livelihoods [3]. Hence, it is important that science teachers need to engage students more in science learning (SL). Rustaman [4] stresses that there is a close link between science teaching and science assessment and the approach of assessment is very important to promote active assessment. The literature notes that in South Africa most students perform poorly in particulate nature of matter (PNM) [5]. PNM is described as the particle model of matter whereby students are required to demonstrate an understanding of the particle nature of matter, for example, to describe the characteristics of solids, liquids, and gases. Also, in South African schools some teachers are more knowledgeable about the content; however, they are struggling to interpret content into successful pedagogical content knowledge [6]. Hence, it is important that there should be a balance between content and assessment so that students can be given an opportunity to apply their critical thinking. Bantwini [7] conducted a study in the Eastern Cape province in South Africa, and the data collected from 22 classrooms revealed that science pedagogical approaches were uninspiring and lacked hands-on activities that promote critical thinking. This implies that such type of science teaching can negatively affect students' conceptual understanding of practical work that serves as the form of assessment of experiments. Thus, teachers need to be proficient when it comes to science pedagogical approaches and encourage student active engagement. Moreover, social constructivism theory emphasizes that student needs to be actively engaged in learning to demonstrate their experiences [8]. Also, the zone of proximal development needs to be encouraged to reach the expected outcomes. Once the students are fully engaged in both learning and assessment and the required support is provided, science learning and teaching become effective. Therefore, teachers need to be well versed with assessment skills that will encourage science learning and science literacy.

2. Literature review

2.1 The importance of assessment in science learning

An assessment provides teachers with information about their students' success in relation to the learning objectives. After students receive feedback, they can recognize their weaknesses, and teachers can reflect on their teaching methodologies and come up with ways to mitigate the challenges. Assessment is very critical; it needs to be enhanced allowing the use of higher-order thinking skills to drive the learning process effectively [9, 10]. It is also a component whereby learning and teaching are strictly interlinked and need to be acknowledged by teachers [11].

The present researchers define assessment as the process of evaluating the progress of learning to see whether the students achieved the learning outcomes and can apply the knowledge given in the real context. Assessment in science needs to be more practical than theoretical to prepare the students for the 21st century. Previous studies note that assessment aims to blend what happens in the classroom with employment [12] to avoid insecurity in the world of work [13]. Thus, assessment should have an impact on the quality and deepness of learning achieved by the students [14]. Moreover, the literature notes that students are lacking life skills such as problem-solving, critical thinking, communication skills, and collaboration [15]. By acknowledging and promoting these skills, teachers can build good relations with students

that will make them be able to apply transparency regarding assessments, e.g., discussing dates of assessment and providing clear rubrics. Hence, authentic assessment is encouraged to increase the employability of graduates in the workplace [16].

In a nutshell, teachers need to embrace both theory and practical assessment in class. The demonstration and investigation methods prepare the students to use both higher-order thinking and problem-solving skills. The theory that is learned in class needs to be converted into practical and be assessed using a good rubric. Thus, it is wise for teachers to strengthen the relationship with their students to understand their individual differences, support, motivate, and apply the zone of proximal development when needed.

2.2 Authentic assessment

When designing an assessment, ensure that it is authentic, fair, and equitable. Integrity is to be maintained by minimizing plagiarism, using various assessment methods, and moderating of assessment [17]. Furthermore, [17] illustrates that moderation is important to ensure integrity in the assessment following the process of validity and reliability. Therefore, teachers are required to develop the skills that will assist them in designing assessment tasks that will also value prior learning and learners' abilities [18].

2.3 Promoting both theory and interactive assessment

Both practical and theory are very important in science; thus, assessment needs to be highly valued so that students can showcase their skills, e.g., problem-solving skills and critical thinking skills. Regarding experiments, [15] states the importance of investigation and constructive alignment when doing practical work. For instance, learners need to be equipped with science learning knowledge and skills to understand the uses and implications of science today and for the future. Moreover, [19] reveal that in science, assessment can tackle both evaluation and theory; for instance, when students are given a practical task on photosynthesis, they can be hands-on and at the same time the teacher is facilitating the theory part to enhance learning and teaching. The policy CAPS document stresses that assessment is a continuous and planned process of classifying, gathering, interpreting, and analyzing information about the performance of students [20]. Hence, it is significant that teachers always make use of the policy when planning an assessment.

Ref. [21] report explains the advantages of interactive indirect instruction as one to strive for a high level of student participation in forming hypotheses, investigating, observing, and drawing inferences from data. It takes advantage of students' interest and curiosity, often encouraging them to make other choices to solve difficulties. This is what is needed today for our students as they are curious by nature. Therefore, teachers need to engage and scaffold students in practical tasks as assessments.

3. Problem statement

Ref. [22] highlight that teachers in South Africa are faced with challenges in terms of science resources, content knowledge, and infrastructure. These challenges destructively impact the promotion of science learning. Hence, the researchers believed that in science learning students need to contribute to the investigations so that they can develop good thinking skills as well as practical skills [23]. Science investigation triggers students' interest [24]; moreover, teachers need to balance both

theory and practical. The present researchers believe that investigations in science learning play a role in assessing practical activities. The literature avers that science shapes the students' scientific attitudes such as curiosity, critical thinking, and the desire to solve problems [23]. Thus, the present researchers are of the view that SL can be promoted through science content and practical assessment.

4. Theoretical framework

According to [25], a theoretical framework is a structure that can hold or support a theory of a research study. A theoretical framework, therefore, provides the lens through which the research study is viewed and assists in better understanding the phenomenon under study. Since the study is about learning and teaching, the constructivist learning theory informed it. Constructivism states that learning happens when learners construct their own understanding and knowledge of the world through experiencing things and reflecting on those experiences. Vygotsky et al. [8, 26] identify the key features of the constructivist theory of learning, which are the following:

- The learner is actively engaged in learning.

- The learners' experiences are important in learning.

These aspects suggest that students need to be actively involved in a lesson, and teachers should encourage them to participate in practical activities. Considering their experiences before introducing something new is very important as they are not empty vessels, for example, techniques such as experimentation and problem-solving. Therefore, the present researchers believe that social constructivism encourages teachers to provide students with enough learning materials so that students can actively participate to promote SL through content and practical assessment.

5. Objective

To establish how teachers promote science learning through science content and practical assessment.

6. Question

How do teachers promote science learning through science content and practical assessment?

7. Methodology

To promote science learning through science content and practical assessment, the study adopted a descriptive survey design and a questionnaire was used to collect data.

7.1 Population, sample, and sampling techniques

Thirty out of sixty-seven schools were selected using simple random sampling. This type of sampling was chosen since it provides everyone the equal opportunity

of being selected. The 30 schools are in six out of the eight circuits in the selected education district. Of the 30 schools, each had one grade 9 Natural Sciences classroom with one teacher per school. Thirty teachers volunteered to participate in the research study.

7.2 Research instruments

The data collection instrument was designed, whereby a questionnaire was used, using the four-point Likert scale: agree, neutral, disagree, and no response. The questionnaire attached as Appendix A was designed to measure the promotion of science learning through science content and practical assessment.

The pilot testing was conducted with two teachers using a questionnaire. The present researchers were satisfied with the feedback from the teachers who were involved in the pilot study. The only challenge encountered in the questionnaire was that some questions were ambiguous, and modifications were done.

7.3 Validation and reliability of the research instruments

To ensure validity, the questionnaire was hand-delivered to two NS Subject Education Specialists (SES) and one science teacher for critic feedback before it was used for data collection. A Subject education specialist is someone who provides support to teachers with subject content knowledge, practical activities, relevant resources to be used in schools based on their areas of specialization as well as organizing workshops [20]. The study considered the Cronbach alpha test to ensure the reliability of the instrument. In **Table 1**, Part 5 illustrates the outcomes of the Cronbach's alpha test for the quantitative instrument that was used in this study.

Cronbach's alpha for 14 items in the instrument used in this study is shown as 0.703. This is construed as an indication of high reliability and internal consistency in the questionnaire.

7.4 Procedure for data collection

The structured questionnaire was distributed to 30 science teachers who were requested to complete the task within seven days. After seven days, only 16 had

Reliability Statistics			
	Themes	Cronbach's Alpha	No. of Items
PART 1	Strategies used by educators to teach Natural science curriculum.	0.936	14
PART 2	Strengths and weaknesses of each of the following strategies in promoting SL.	0.448	14
PART 3	Strategies used to support educators to promote SL.	0.936	14
PART 4	Strategies that are most relevant in enhancing SL.	0.368	10
PART 5	Strategies educators use to assess students' SL.	0.703	14
	Instrument	0.911	64

Table 1.
Cronbach's alpha reliability of internal consistency for Likert scale.

completed. Those who were not ready for submissions were given four more days to respond to the questionnaire which was later collected by the researchers.

7.5 Data analysis

Both descriptive and inferential statistics were employed in the analysis of the collected data. The research question was answered using science teachers' frequency counts and percentages as follows: promotion of science learning through science content and practical assessment responses: Principles of assessment, those who agreed were 70% and above, while neutral were 30% below; disagree—0%; and no response—0%.

8. Ethical considerations

Respondents were informed about the significance of the study and its purpose. School principals and science teachers signed the informed consent. Respondents were also informed, as part of their consent that the results of the study would be made available to them on request. Moreover, they were told that their responses would remain anonymous and confidential and their names would not be written even if the findings were published.

9. Results

Table 2 illustrates quantitative results on how educators assess science learning and promote science learning.

The data in **Table 2** illustrate how teachers assess SL. The responses were as follows: agree, neutral, disagree, and no response.

9.1 Agree

Align with cognitive domains 86.7%; Principles of assessment 77%; Investigations 66.7%; Simulation 63.3%; Debates 50%; each among these: Assignment, Experiments, and Examinations 40%; Problem-Solving 37%; Projects 34%; Presentation 23%; Roleplay 17%; Tests 13.3%; and Quiz 7%.

9.2 Neutral

Presentations 70%; Problem-Solving 60%; Experiments 57%; projects 53%; each among these: Tests and Examinations 50%; Assignments 46,7%; Debates 34%; each among these: Simulations and Investigations 30%; Roleplay 27%; Quiz 23%; Principles of assessment 13%; and Align with cognitive domain 10%.

9.3 Disagree

Quiz 70%; Roleplay 53%; Tests 13.3%; each among these: Debates 13.3%; Examinations 13%; each among these: Debates and Projects 13%; each among these: Principles of assessment, Assignments, and Examinations 10%; Presentations 7%; Simulations 3.3%; each among these: Problem-Solving and Align with Cognitive domain 3%; each among these: Experiments and Investigations 0%.

Strategies	Responses	Frequency	Percentage %
Principles of assessment	Agree	23	77
	Neutral	4	13
	Disagree	3	10
	No response	0	0
	Total	**30**	**100**
Align with cognitive domain	Agree	26	86.7
	Neutral	3	10
	Disagree	1	3
	No response	0	0
	Total	**30**	**100**
Tests	Agree	4	13.3
	Neutral	15	50.0
	Disagree	4	13.3
	No response	7	23.3
	Total	**30**	**100**
Assignments	Agree	12	40.0
	Neutral	14	46.7
	Disagree	3	10.0
	No response	1	3.3
	Total	**30**	**100**
Presentations	Agree	7	23
	Neutral	21	70
	Disagree	2	7
	No response	0	0
	Total	**30**	**100**
Quiz	Agree	2	7
	Neutral	7	23
	Disagree	21	70
	No response	0	0
	Total	**30**	**100**
Projects	Agree	10	34
	Neutral	16	53
	Disagree	4	13
	No response	0	0
	Total	**30**	**100**
Experiments	Agree	12	40
	Neutral	17	57
	Disagree	0	0
	No response	1	3
	Total	**30**	**100**

Strategies	Responses	Frequency	Percentage %
Debates	Agree	15	50
	Neutral	10	34
	Disagree	4	13
	No response	1	3
	Total	**30**	**100**
Examinations	Agree	12	40
	Neutral	15	50
	Disagree	3	10
	No response	0	0
	Total	**0**	**100**
Roleplay	Agree	5	17
	Neutral	8	27
	Disagree	16	53
	No response	1	3
	Total	**30**	**100**
Problem solving	Agree	11	37
	Neutral	18	60
	Disagree	1	3
	No response	0	0
	Total	**30**	**100**
Simulation	Agree	19	63.3
	Neutral	9	30.0
	Disagree	1	3.3
	No response	1	3.3
	Total	**30**	**100**
Investigation	Agree	20	66.7
	Neutral	9	30.0
	Disagree	0	0
	No response	1	3.3
	Total	**30**	**100**

Table 2.
Responses on how educators assess SL.

9.4 No response

Tests 23.3%; each among these: Assignments, Simulations, and Investigations 3.3%; each among these: Debates and Roleplay 3% and all others 0%.

Most of the respondents 86.7% agreed that they adhere to the use of Alignment with the cognitive domain, Principles of assessment at 77%, Investigations at 66.7%, and Simulations at 63.3%. It was agreed that practical and hands-on approaches are some of the best instructional methodologies to enhance SL. Similarly, there can be no sufficient and proper sciences curriculum without experiments. Consequently, alignment with the cognitive domain and employment of the principles of assessment as strategies for assessment should be used for the promotion of science learning and science literacy.

When enquired, 50% of respondents agreed that debates are useful and effective methods of assessment, while 34% were neutral and 13% disagreed. Examinations and tests are an inescapable part of the assessment of the South African curriculum, and as such, it was expected that the approval rate would be relatively high, but they were low at 40% and 13.3%, respectively.

Neutral participants toward presentations, problem-solving, and experiments were relatively high at 70%, 60%, and 57%, respectively. This outcome although expected to be high, in science learning and teaching presentations, problem-solving and experimentation are considered as part of the salient assessment strategies. The outcomes of this study illustrate that the strategies mentioned in this paragraph are not used by most teachers due to the remoteness of the schools, lack of resources, and lack of pedagogical content knowledge. It clearly illustrates that rural schools do follow the policy [24] which highlights that all forms of assessment involve generating and gathering evidence of achievement and evaluating this evidence using these different forms. However, some of the teachers lack the implementation of the key assessment strategies that promote science learning and science literacy.

Quizzes are not a relatively common practice for assessment in rural schools in South Africa, and as such, the agreement rate declined: 13.3% with 50% neutral, 13.3% disagreed, and 23.3% did not respond to the question. These results prove that there is a need for professional development on how to assess science content.

10. Interpreting the summary of findings

Table 2 shows that teachers are knowledgeable of the principles and application of assessment methods. It is not in all cases that this knowledge is transferred into practical application by teachers, some are either unwilling or indifferent in their assessment practices, and thus, there was no 100% consensus in terms of adhering to principles and cognitive domain. The evidence is that the teachers use the most common assessment methods. Thus, [1] note that assessment is fundamental to students' conceptual understanding; for the students to grasp the content knowledge, different assessment approaches need to be employed.

Singh et al. [15] clarify the importance of assessment and emphasize that science educators must use high-quality assessment process when assessing learners. The CAPS document also stresses the importance of assessment [24] Debates were generally not considered as important, and Quizzes are not quite a common practice for assessment in rural schools in South Africa. Therefore, the present researchers are of the views that these types of assessments are also very important in science learning. They give students the opportunity to apply both their solving and analytical thing. These skills will assist the students even in the workplace.

11. Conclusion

The study confirmed that science teachers use the most common and easiest assessment methods of tests and assignments in their classes. However, the key findings also reveal that assessments such as Quizzes, Roleplay, Presentation, Problem-solving, and Experimentation are not considered very important. Moreover, these types of assessments are not commonly used in rural schools in South Africa due to the remoteness of the schools, lack of resources, and lack of pedagogical content

knowledge. Thus, it is very important that departmental officials give full support to science teachers.

12. Recommendations

The curriculum specialists need to motivate and encourage science teachers by organizing seminars, workshops, and educational conferences to share science content knowledge, strategies for assessment, and resources to use practical activities.

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Conflict of interest

There is no conflict of interest by any of the authors of the study.

Appendix A: Part: 5, Research guiding question

What strategies do educators use to assess students' science literacy?

Strategies	Agree	Neutral	Disagree
Principles of assessment			
Align with cognitive domain			
Tests			
Assignments			
Presentations			
Quiz			
Projects			
Experiments			
Debates			
Examinations			
Roleplay			
Problem-solving			
Simulation			
Investigation			

Which other strategy would you use?
....
Mention any other strategy which you know.
....
End of the questionnaire: Thank you for participating, I am very grateful.

Author details

Nomxolisi Mtsi*, Shakespear M. Chiphambo and Nomaroma Kumanda
Walter Sisulu University, South Africa

*Address all correspondence to: nmtsi@wsu.ac.za

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Chapter 28

Signature Pedagogies in Vocational Learning

Janet Hobley

Abstract

This section will look at differing concepts of pedagogy using research data collected at a college that is at the forefront of using technology as a tool for learning. The data collected was originally analysed using the concepts of Pedagogical Content Knowledge (PCK), Technological Pedagogical Content Knowledge (TPCK), Signature Pedagogies and expansive vocational education to see how these concepts applied to practice. The research indicated that whilst there were differences in the pedagogical content approach, the concept of signature pedagogies was strong across all the vocational curriculum areas looked at. It highlighted several instances where the teachers were using an 'implicit structure' in their pedagogy to draw out the moral aspects of the profession and the inherent principles that guide a professional in a particular field. Finally, it confirms that through using signature pedagogies teachers are able to develop habits of the heart, mind and hand in their learners and to cultivate learners who 'think like professionals'.

Keywords: pedagogical content knowledge, technological pedagogical content knowledge, signature pedagogies, expansive education

1. Introduction

This chapter investigates the relationship of varying pedagogical definitions alongside observations of teaching practice within different vocational areas. These pedagogical concepts include Technological Pedagogical Content Knowledge (TPCK), Signature Pedagogies and expansive vocational education. Originally Shulman [1] defined pedagogy in distinct ways that incorporated concepts such as Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) and both relate to both academic and vocational pedagogy. However, for now the emphasis is on a consideration of signature pedagogies in vocational learning and its importance in professional learning.

2. Vocational pedagogies

According to Shulman [2] Content Knowledge arises from the knowledge of the discipline being taught and here he uses the example of Biology as the subject in question. In terms of teaching, he raises some interesting questions such as "How does the novice teacher (or even the seasoned veteran) draw on expertise in the subject

matter in the process of teaching?" (p. 8). Ultimately this is about the amount and organisation of knowledge that the teacher has. Pedagogical Content Knowledge on the other hand refers to the way that the teacher organises specific topics and ranks them according to difficulty in learning. In this way he or she is able to build up a coherent scheme of work that builds knowledge and scaffolds it so that it becomes more accessible to learners. Here Shulman means the most frequently taught topics and the most accessible forms of representation and illustrations of that topic, again with the desire to make it more accessible to learners. In the past these would have been 'cut and pasted', photocopied and reproduced for the learners, nowadays the internet has allowed a different form of cut and paste. Hence in the light of technology Shulman's original definitions of teacher knowledge have been revised and here a different dimension has been added to these concepts, that of Technological Pedagogical Content Knowledge (TPCK). Several authors (Koehler and Mishra [3] and Harris et al. [4]) discuss this concept and define the term as the effective use of technology in teaching and learning. Here it assumes that a teacher has some technical content knowledge, that is some knowledge of technology available to teaching as resources to illustrate and represent topics. Here the Content Knowledge, and PCK as advocated by Shulman come together as Technological Content Knowledge in other words, the knowledge of how technological aids can enhance these representations. However, this is all very well if the technology also aids pedagogically or if it is chosen just because it is there. Here the new concept of TPCK presents different challenges to teachers today.

3. Technological pedagogical content knowledge

TPCK can be viewed as the basis of good teaching with technology and requires an understanding of the way concepts can be represented through using emerging technologies and by using the correct pedagogical principles that use that technology in a constructive way to allow access to content. This is different for example than knowing that Padlet is an 'app' (application), it also involves cognition as to how this technology can help in pedagogical ways as well. Here Padlet can be used in collating student ideas and as collaboration in learning. It allows a more student-centred approach to construction of knowledge and hence application and analysis of that specific subject knowledge.

4. Signature pedagogies

However more recently another concept of pedagogy has emerged in the literature, that of 'signature pedagogies' which is defined as "types of teaching that organise the fundamental ways in which future practitioners are educated for their new professions" Shulman [1]. This concept is of particular importance in a vocational context as here students are being prepared for specific professional careers such as Hairdressing, Engineering and Construction amongst others. Recent literature has revolved around the concept of vocational pedagogies and how students in vocational education and training are taught differently from more academic courses based on theory alone. As a concept signature pedagogy is an idea that Shulman [1] applied to vocational areas of learning and noted here that the learner is 'trained' in three areas of the professional work involved. These are:

- Thinking as a professional

- Performing as a professional

- Acting as a professional

Shulman [1] goes onto note three dimensions to signature pedagogy, these being 'surface structure', 'deep structure' and an 'implicit structure'. The surface structure he argues is the operational aspects of teaching and learning such as questioning students and demonstrating specific techniques important to those professions. In Hairdressing these would be demonstration of specific skills such as cutting hair and for example in Engineering, underpinning health and safety around the correct use of large lathes. The deep structure involved a set of assumptions about how to impart the specific knowledge within that profession and again in Engineering, this would be how to solve problems and find solutions. Finally, the implicit structure according to Shulman involves the moral aspects of that profession such as attitude, values and dispositions. Here he uses law as an example of legal reasoning and moral judgements.

Lucas and Hanson [5], as does Shulman, go one step further and refer to signature pedagogies as defining habits of hearts, mind and hands. Shulman [1] notes "One thing is clear: signature pedagogies make a difference. They form habits of the mind, habits of the heart, and habits of the hand". For Lucas and Hanson these habits of mind can be described in Engineering as EHoM (Engineering Habits of Mind) and this involves as the following:

- Systems thinking (seeing whole, systems and parts, and how they connect, pattern-sniffing, recognising interdependencies, synthesising)

- Problem finding (clarifying needs, checking existing solutions, investigating, contexts, verifying)

- Visualising (move from abstract to concrete, manipulating materials, mental rehearsal of physical space and of practical design solutions)

- Improving (relentlessly trying to make things better by experimenting, designing, sketching, guessing, conjecturing, thought-experimenting, prototyping)

- Creative problem solving (applying techniques from other traditions, generating, ideas and solutions with others, generous but rigorous critiquing, seeing engineering as a "team sport")

- Adapting (testing, analysing, reflecting, re-thinking)

Lucas and Hanson [5] conclude that those involved in engineering teaching and learning need to consider redesigning engineering education and start from the premise that they are trying to "cultivate learners who think like engineers, and we have suggested that a clearer articulation of the signature pedagogies of engineering may support this aim." (p. 12).

Whilst not within an engineering context Claxton [6] too refers to Habits of mind as specific skills and attitudes to learning such as "resilience, creativity, communication, team working, leadership, flexibility, resourcefulness, reflection and metacognition"

(p. 6). Lucas et al. [7] also use the term 'expansive education' as a means of redefining vocational or 'real-world learning' and here we see terms such as resourcefulness, self-belief and 'wider dispositions for lifelong learning' (p. 138). Lucas et al. [7] go onto unpick this concept further to look at the part that the teacher has on learning, through being 'feedback-rich' (p. 133). By this they mean 'critical reflection on progress' and how feedback provides learning with purpose and progression.

It is clear from the literature that signature pedagogies make a difference and as Shulman noted in 2005, they inform habits of the mind, heart, and hands. It follows therefore that teachers need to use these more in vocational learning to enable students to think like professionals with resilience and resourcefulness at the heart of what they do. The following section therefore looks to practice to see how vocational teachers do use signature pedagogies in practice.

5. Methodology of research

In order to research the way that vocational teachers integrate the concepts of signature pedagogies into their day-to-day teaching, data was taken from a series of classroom observations within a vocational college in the Southeast of England. Staff here are routinely observed either within a theory classroom-based lesson or in a practical workshop involving skill-based learning. Observations are part of the quality assurance process and are recorded as a narrative report rather than a tick box approach. These are not graded but teachers are given specific targets for improvement based on what was observed in that session. Data was collected over two academic terms and here both practical and theory sessions were observed. There were 13 lessons observed in total, of these 11 were theory-based sessions with 2 practical ones. The vocational subjects seen were a Construction practical session, two Hairdressing sessions, one practical and one theory based. The other observations came from Engineering, two different theory lessons, Gas, two theory lessons, two Health and Social Care theory lessons, two Media theory sessions and two Plumbing theory sessions. All teachers seen were experienced in their vocational subject having been practitioners first and teachers later in life. In terms of demographics most were middle aged and had been teaching for several years. The Hairdressing and Health and Social Care teachers were female as was one of the Engineering teachers. The Media sessions was split between one male and one female and here the female teacher was a novice teacher in her first year of teaching having spent some years in broadcasting. All the Gas, Construction and Plumbing teachers were male. The observations were written up in full and comments were extracted from the observation feedback and analysed according to the following concepts relating to signature pedagogies in both practical and theory lessons. These were:

- a surface structure – where there was a reference to teaching methods

- a deep structure – where there was a reference to specific professional learning

- an implicit structure – where there was a reference to the moral or value judgements of that profession

Using this data allowed an overall view of how signature pedagogy is incorporated in teaching of vocational learning. The following section outlines the findings of the observed sessions.

6. Findings

Table 1 shows the thirteen sessions observed with a breakdown of theory or practical. The comments in column two have been extracted from the full observation feedback as they show aspects of signature pedagogy. Column three shows the analysis of the comment in the light of Shulman's [1] dimensions of signature pedagogy, these being surface/deep/implicit. All lessons observed showed deep or implicit dimensions of signature pedagogy in practice, these being references to specific professional learning or moral or value judgements.

Vocational subject	Observation comment that relates to the way that the teacher is demonstrating signature pedagogies	Dimension: surface/deep/implicit
Hairdressing theory lesson 1	Wonderful, you talked about training as a hairdresser rather than just passing the exam. Good demonstrations seen that helped the learners to see a professional in practice.	Deep
Hairdressing practical lesson 2	Whole group is managed well and there is a brisk pace which is reinforced with reference to 'hairdressing pace', excellent standards required here	implicit
Engineering theory lesson 1	Reinforcement of key rules such as the need for the equation, excellent practice for their future as engineers.	deep
Engineering theory lesson 2	Here the project was linked to the real world of project management and the skills needed here (S). Linked to money and budgets as well. Well done.	Deep/implicit
Health and Social Care theory lesson 1	Made relevant to the real world of work and what they want to do in the future.	deep
Health and Social Care theory lesson 2	The topic was linked well to being a professional and the need for CPD, formative assessment via using whiteboards, here students write their ideas about how to complete CPD	deep
Gas theory lesson 1	The topic was gas decommissioning, and it began with consideration of the Duty of Care involved in any gas work undertaken. Excellent analogy provided which clearly highlighted the need to refer work that was not safe to the correct person/authority (S). This really showed the students the importance of never leaving work with a possible gas leak. This was reinforced with the legislation (RIDDOR) and the need to report any gas leaks immediately. The major strength seen here was the constant reference to the professional approach that needs to be taken when dealing with gas. This was done through the repeated reference to Duty of Care and the possibility of killing someone if gas explodes!	implicit
Gas theory lesson 2	Excellent use of own experiences and local knowledge with regard to the damage gas fires can do and you respond well to student questions here as well. You made it relevant to the exam that the students need to take and above all a strength here was the constant reference to the professional approach needed with regard to Duty of Care and the possibility of 7 years for manslaughter. This was reinforced several times as was the competence required for different equipment and ongoing need to continuous professional development as a gas engineer.	implicit

Construction practical lesson 1	Excellent use of humour and how to learn from mistakes and to move on. All this is good grounding for professional practice. Students rated this and it was then made clear to them as to the importance of this technique as practice for being a master craftsperson. Well done here, this showed the need for a professional approach to the trade.	implicit
Plumbing theory lesson 1	Discussion then moved to being a professional, although you did not mention this word. You did note the need for CPD and the regulations for renewal of the card at 5-year intervals.	Implicit/deep
Plumbing theory lesson 2	This was also well related to actual work as a plumber and you made good use of a past student to illustrate key points	deep
Media theory lesson 1	However, it was a useful exercise as it allowed you to evaluate the brief as well as being a chance to emphasize the need for some practical procedures that they would need in industry, this part was excellent as it really linked to the world of work	deep
Media theory lesson 2	This was also related to merit/distinction etc and again related to which area of the industry they might like to focus on in future. Logbooks were related to interview skills and you made it clear that even if they did not like doing them, they needed to! Linked to Btec rules of working with more than one person and again to real work ie getting a script and being creative.	deep

Table 1.
To show the observation data analysed in terms of the way that vocational teachers use signature pedagogies in practice.

7. Discussion

Interestingly the strongest lessons showing aspects of an implicit structure for a signature pedagogy came from the plumbing and construction teams. This was seen as implicit due to the references concerning health and safety and craftmanship. There were three lessons observed in this department, two theory-based lessons and one practical. Clearly the issue of dealing with a potential gas hazard can be considered as a moral judgement as did the comment made about being a master craftsman. In these instances, the teachers were drawing on their own experience as master craftsman to highlight the professional aspects of their trades. The comment regarding a 'hairdressing pace' was seen in a practical session in which the teacher was getting the learners to work at a pace appropriate to a real hairdressing salon even though they were still training. A point worth making here is that both gas and hairdressing involve working directly with customers and that in both health and safety is vital to a professional approach.

The lessons which were deemed to show deep structures rather than implicit ones were because they did not touch on the moral aspects of the craft but rather were aspects of specific knowledge relating to that subject. Here there were several references to the real world of work and being a professional. Here as well the teachers were modelling good practice as in for example, the hairdressing teacher who was demonstrating techniques in a professional way so as to enable students to observe a professional person in action. This resonates with Claxton's [6] ideas of habits of mind

where teamworking, creativity and communication are important skills required for that profession.

To some degree it can be argued that in Engineering there were elements of habits of mind as the reference to the need for 'equation' does highlight the need for students in this discipline to be able to visualise or 'move from abstract to concrete' as Lucas and Hanson [5] indicate as being an EHoM for this subject. Finally, it is clear from all the observations undertaken that there were deep structures of teachers using signature pedagogies as part of professional vocational learning.

8. Conclusion

To return to the literature, Shulman [1] applied the concept of signature pedagogy as one in which the learner is 'trained' to think, perform and act like a professional. The outcome he argued, would be that through the implicit structure of the pedagogical approach, learners would gain the valued dispositions for that profession. From this data it can be seen quite clearly that the vocational staff involved in teaching students today do use signature pedagogies in their day-to-day teaching, both in theory and practical sessions. The repeated reference to Health and Safety in working with gas was reinforcing the moral judgements that a professional must exercise at all times, the implicit structure that Shulman claims is part of signature pedagogy. Similarly, reference to the 'pace of hairdressing' shows how the trained professional must act and perform when working on real clients.

In terms of cultivating the habits of mind, heart and hand, there is evidence that the teachers were developing these by role modelling as seen in hairdressing, learning from mistakes as seen in the practical construction class and reinforcement of the 'rules of equation' seen in engineering. Unfortunately, the EHom that Lucas and Hanson [5] refer to was not really seen in the data, this is intended to be further research within this particular vocational area in the future.
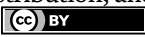
Conflict of interest

The authors declare no conflict of interest.

Author details

Janet Hobley
Basingstoke College of Technology, Hampshire, United Kingdom

*Address all correspondence to: janet.hobley@bcot.ac.uk

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Making Higher Education Count in Sub-Saharan Africa: Lessons from John Dewey's *My Pedagogic Creed*

Daniel Dei

Abstract

The study focuses on strengthening higher education in Sub-Saharan Africa through John Dewey's *My Pedagogic Creed*. Many educationists widely admire Dewey's philosophy of education, yet his enduring message—the inseparable connection between education and society—is often misunderstood. His deep understanding of the connection between the school and the larger social context is relevant to recent efforts by Sub-Saharan African governments to enhance authentic higher education. From the standpoint of Dewey's fivefold themes—education, school, subject-matter, method, social progress—the study discusses the integration of educational resources for achieving the task of higher education in Sub-Saharan Africa. Though modern theorists may recast Dewey's pragmatic theory of education, this social critical study proposes that Dewey's placement of learners at the center of the interaction between the school and society points to a more satisfactory result that could reform higher education in Sub-Saharan Africa.

Keywords: curriculum, heutagogy, higher education, John Dewey, pragmatism

1. Introduction

As the 21st-century gradually shifts from a manufacturing-based economy to a knowledge-based information economy, higher education is increasingly gaining significance ([1], pp. 6–7). Contemporary societies have high expectations of their higher education system. The practical benefits they anticipate harnessing from higher education include economic, health, and civic engagement. It is claimed that higher education reduces unemployment, offers job security that reduces financial stressors, and a citizenry that cooperates with its government ([2], p. 88; [3], pp. 44–45). Consequently, governments of modern societies continue to invest in higher education.

There has been acute stress on Science, Technology, Engineering, and Mathematics (STEM) education within higher education around the globe in recent

times.[1] The desire for STEM education emerges from the quest to train individuals to prepare for the challenges of the 21st-century. While some of these problems are known, others are largely unknown. For example, terminal diseases such as Ebola and Coronavirus and socioeconomic issues such as poverty, governance, and climate change threaten human life. On the phase of both known and unknown threats to human life and survival, higher education is expected to invest learners with the capacity to understand the volatile conditions of the 21st-century and be competent to deal effectively with these challenges. Higher education is expected to introduce learners to a whole range of organic and inorganic experiences to create new or improve upon existing measures for the survival of the glocal society.

John Dewey's pragmatic theory of education becomes relevant at this point. His theory broadly connects learners with society. Learners cannot deal with the challenges of the 21st-century if they continue to receive the educational contents that are mutually exclusive from society. This means that both the society and the school must have a common purpose. John Dewey's *My Pedagogic Creed* shows how society and schools can establish and pursue a common purpose—assisting learners to understand and manage their complex social experiences.

Recent educationists have recast Dewey's pragmatism into various learning models known as student-centered learning. The shift from the teacher's desire and purpose in the curriculum to learners permeates these learning models. Usually, teachers encourage learners to be part of the educational process and inspire them towards leading various learning activities in the school. These learning experiences are a set of "...collaborative activities, goal-driven tasks, intellectual discovery, activities that heighten thinking, and activities that provide practice in learning skills" to learners ([4], p. 420). The strong emphasis on the learner's independence in the learning process often overshadows the interrelatedness between the school and the larger society. While Dewey expected learners to decide the contents and method of their education, he hoped their engagement with the larger society would create a mutual context by which they could determine the task of education. This interrelatedness between society and the school is the basis of Dewey's pragmatic theory of education. However, modern education theorists seem to have pushed away from this foundation.

The thrust of this study is that Dewey's pragmatic theory of education may assist the 21st-century educationist in achieving the critical task of higher education—investing learners with the capacity and skill in dealing effectively with the known and unknown challenges of the 21st-century. In doing this, the study examines Dewey's fivefold themes in *My Pedagogic Creed*. With these themes at the background of succeeding analysis, the article discusses and draws out implications of Dewey's view for higher education in Sub-Saharan Africa. The present study is a connected social criticism of higher education in Sub-Saharan Africa, and it relies substantially on Dewey's views and other secondary sources that either praise or criticize his pragmatic notions in *My Pedagogic Creed*. The author's participation, observations, and desire for the relevance of higher education in 21st-century Sub-Saharan Africa is the backdrop for this discourse.

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[1] The apparent neglect of the Arts and Humanities for STEM education must be resolved. The Arts and Humanities establish firm foundations for the operations of knowledge gained from STEM education. By ignoring the Arts and the Humanities, it is feared that the 21st-century society may be eroding the moral contexts that regulate the skills acquired through STEM. The effects of amoral STEM education may lead to unimaginable dire ends.

2. Higher education in Sub-Saharan Africa

Sub-Saharan Africa comprises 48 countries, with a population of about 1 billion ([5], n.p.). Higher education in Sub-Saharan Africa continues to expand ([6], p. 1). For example, student enrollment increased from 5.9 million in 2010 to 8.3 million in 2019 ([7], n.p.). A significant enrollment increment was recorded in Mauritius, Cape Verde, Botswana, South Africa, Namibia, Sudan, Seychelles, Senegal, Congo D.R., Ghana, Guinea, Cameroun, Togo, Nigeria, Lesotho, Kenya, and Benin ([5], n.p.). The general expectation that higher education would lead to the development of the Sub-Saharan African region is the basis for this expansion ([8], p. 174). Higher education is expected to produce competent, highly skilled labor who perform various roles in significant sectors in these developing economies ([6], p. 6).

However, a general doubt exists on the quality of higher education in Sub-Saharan Africa ([9], p. 75). Studies show that deficit research capacity, poor quality of university professors, lacking educational resources/facilities, and disconnection between industry and higher education institutions are some of the factors that impede the quality of higher education in Sub-Saharan Africa ([10], pp. 20–21; [11], pp. 13–14; [8], p. 174). Many governments have adopted various strategies to improve the quality of higher education ([12], p. 66). The African Graduate Fellowship Program (AFGRAD; 1963–1990); the Advanced Training for Leadership and Skills Program (ATLAS; 1991–2003); the Collaborative Research Support Programs (CRSPs) or the "Feed the Future Innovation Labs for Collaborative Research," 2013; and the Partnership for Higher Education in Africa (PHEA) are some of the strategies for strengthening higher education in Sub-Saharan Africa. *Agenda 2063* ([13], p.12), approved by 54 African countries, is a recent measure to improve higher education in the region through a Pan-African E University that enhances

> *...human capital, science and technology and innovation through increasing access to tertiary and continuing education in Africa by capitalizing on the digital revolution and global knowledge; reaching large numbers of students and professionals in multiple sites simultaneously by developing relevant and high quality curriculum and ensure the prospect African student a guaranteed access to the University from anywhere in the world and anytime (24 hours a day, 7 days a week).*

Some of these approaches allow the private sector to invest in higher education. For example, the private sector involvement in higher education in Ghana and Ethiopia is 15%, 20% in Kenya, and about 36.7% in Nigeria and Senegal ([11], p. 13). It is estimated that these investments and measures will produce laudable improvement in the quality of higher education in Sub-Saharan Africa. However, the nature of higher education, study environment, curriculum, method, and social engagement of higher education institutions in Sub-Saharan Africa reveal a shortfall.

Since their establishment, higher education in Sub-Saharan Africa has been used as a tool towards a particular end. Higher education established the avenue by which colonial worldview was transmitted from the colonialists to their subjects during colonial times ([14], p. 36). Higher education institutions produced a workforce needed to keep the colonial operations active ([9], p. 75). In postcolonial Africa, higher education continues to be a tool to socioeconomic ends. Higher education is expected to produce a skilled/professional workforce to drive economic and infrastructure development. Also, higher education has the task of recasting the African identity such that the African worldview can be sustained in an increasingly

globalized world ([13], p. 2). Further, it is expected that higher education will produce a citizenry that understands their civic duties and promote social cohesion ([13], p. 2).

Unfortunately, higher education's socioeconomic return has not been satisfactory in the Sub-Saharan African region. An underlining factor is a critical gap between higher education and the larger community. The disengagement between higher education and society has existed right from the inception of higher education institutions. Colonialists' purpose for higher education was external to the Sub-Saharan African society ([9], p. 75). African culture was disregarded, so no connection existed between higher education and the socioeconomic demands of the social context that hosted higher education institutions ([14], p. 37). The result was the disparity between higher education products and existing markets/industries in society. Academics and corporate players have varying views on higher education, employment requirements, and students' attitude and abilities for the labor market. The widening gap between higher education institutions and the larger society means that little connection exists between higher education and the developmental goals and strategies of Sub-Saharan African countries. Presently, industrial support for higher education in Sub-Saharan Africa is either negligible or non-existing, leading to incongruence between higher education products and corporate requirements ([6], p. 24). This disparity set the stage for the migration of skilled force from Sub-Saharan Africa to mostly Western destinations. Accordingly, higher education holds little relevance for African societies ([14], p. 41).

Recent developments have positioned knowledge and information at the center of socioeconomic growth ([15], p. 1). Production factors and economic capital have been redefined. This positioning means that higher education is needed to drive socio-economic developments by producing a labor force that can effectively contribute to national and international growth. There is a need for a practical reconceptualization of higher education in Sub-Saharan African societies to reposition higher education institutions to satisfy the demands of a knowledge-based information economy. Dewey's proposal of educational reformation could aid the reconstruction of higher education in Sub-Saharan Africa to meet the varied demands of a knowledge-based information economy.

3. Dewey's fivefold themes in *My Pedagogic Creed*

John Dewey was born in Burlington, Vermont, USA, on 20th October 1859. His father was Archibald Sprague Dewey, and his mother was Lucina Artemisia Rich. He attended the University of Vermont and John Hopkins University. Dewey was a leading figure in pragmatic philosophy and a significant voice in educational reforms in 20th-century America. His pragmatic philosophy underlines his books on education: *My Pedagogic Creed* (1897); *The Primary-Education Fetish* (1898); *The School and Society* (1900); *The Child of the Curriculum* (1902); *Democracy and Education* (1916); *Schools of Tomorrow* (1915); and a co-authored book *Experience and Education* (1938). His most famous book is *My Pedagogic Creed*.

Writing at the turn of the 20th-century, when the task of education was to produce labor to serve the needs of industries, Dewey challenged the current education structure. His model focused on the interaction between the school and society as the entwined focus of authentic education. Consensus on the literature on Dewey links him to Hegel's non-idealistic influences. However, he deferred in his quest for

non-reductionist psychological concepts on social, mind, and consciousness. Also, Darwin's *Origin of Species* likely influenced Dewey's thoughts on progressive education. There is a strong connection between William James and John Dewey. Dewey advanced concepts on pragmatism that James initiated. His "melioristic, pragmatic account of social practice; his emphasis upon the importance of habits in organized human life; his presentation of the role of philosophy as a means of improving daily life; his recognition of the social nature of the self; and his call for a rejection of religious traditions and institutions in favor of an emphasis upon religious experience" are all indications of themes from James' philosophical thoughts ([16], p. 614).

3.1 What is education?

Dewey sees education as a conglomeration of the "social consciousness" of either the whole human race or a specific aspect ([17], p. 3). All community members are introduced to this consciousness from birth, and it continues through their adult lives. The daily exchange of ideas, concepts, and emotions are some of the ways by which members are educated. Broadly, these processes are unconscious. "Through this unconscious education, the individual comes to share in the intellectual and moral resources" of his or her society ([17], p. 3). Also, the individual inherits and contributes to this legacy of education within the community. Thus, Dewey suggests that formal education is either the organization of the legacy of socialization to make learners understand and participate in it or a systematic process by which the various elements of the legacy of education are categorized to point individuals to specific directions in the ongoing process of civilization.

Dewey believes formal education has two dimensions—psychological and sociological. The psychological aspect focuses on developing the individual's internal competencies—the individual's unique way of thinking, behaving, and feeling. An advanced version of these competencies provides a self-understanding that translates self-preservation into sociability. The individual acts "as a member of a unit, to emerge from his original narrowness of action and feeling and conceive of himself from the standpoint of the welfare of the group to which he belongs" ([17], pp. 3–4).

The sociological aspect of education is interested in the clarification of values and meaning from the collective standpoint. These values and meaning provide a framework by which the individual understands his or her place in the community. Individuals acquire knowledge about positive and negative social behaviors through the sociological aspect of formal education. This knowledge helps the individual use his or her internal competencies for meaningful development in his or her community.

Accordingly, Dewey thinks that education must move from the psychological component to the sociological component. He states, "...the psychological is the basis. The child's own instinct and powers furnish the material and give the starting point for all education" ([17], p. 4). He calls on all educators to understand the internal competencies of the learner, without which formal education will be "reduced to a pressure from without" ([17], p. 4). At best, such a system of education will be "haphazard and arbitrary" ([17], p. 4). Worst, it may lead to "friction, or disintegration, or arrest of the child's nature" ([17], p. 4).

The sociological dimension determines the goal of formal education. The individual's internal competencies are appropriately classified and empowered within the social context. The social reflection on these internal competencies provides direction to the individual. While the social context indicates the place of individuals in the shared educational experience, it also propels them to participate in the community's

aspirations. By knowing where the community is heading in the future, individuals are directed to what must be achieved to continue contributing to the legacy of education in the community.

For Dewey, both the psychological and sociological dimensions are "organically related" ([17], p. 5). No attempt should be made to pitch one against the other as in a "compromise" or "superimposition" ([17], p. 5). While the psychological component assists the individual to come to terms with his or her internal competencies, the sociological dimension points the individual towards society's aspirations. Awareness of societal advancement prepares the individual to contribute towards society's progress.

3.2 The school

Dewey sees the school as a "social institution" that continues the education started by society ([17], p. 7). The school environment must ensure that the learner is a participant in the legacy of knowledge. It must seek to help the learner contribute to the ongoing experience of knowledge. Dewey believes education must focus on preparation for life instead of being preoccupied with the future ([17], p. 6).

Society introduces the learning experience to the learner through social interactions at home, neighborhood, and playground. However, these experiences are vast, and their complexities are likely to disorient the learner: "Existing life is so complex that the child cannot be brought into contact with it without either confusion or distraction; he is either overwhelmed by multiplicity of activities which are going on, so that he loses his own power of orderly reaction..." ([17], p. 7).

Being part of the larger community, the school must be an extension of the educational experiences. It must simplify the details of these experiences so the learner can quickly grasp them. The school must present the realities of life in an organized manner in ways that are meaningful to the learner. The aim is to make the learner understand societal values, activities, and observations and identify their place in it. The focus must be on social life—the school must be a continuation of social interactions and assist the learner to develop soft skills in his or her social relations. In particular, the learner must be assisted to develop self-control. The learner will master appropriate ways to respond to complex conditions embedded in social interactions in the larger society through self-regulation. Teachers must encourage the learner to select good influences and responses from these social relations. Teachers can do this through their "larger experience" and "riper wisdom" ([17], p. 9).

Similarly, school discipline must replicate the elements of discipline in society. Once the learner understands the importance of these disciplinary elements, they would integrate them into their social lives. They would become law-abiding citizens. This is why school assessment must test the learner's consciousness of social relatedness, adaptation, and adjustments needed to be significant members of society ([17], p. 9).

3.3 Subject-matter/curriculum

Dewey believes that the social life of the learner should be the basis of the curriculum ([17], p. 10). The curriculum organizes the unconscious experience of social life so learners can have self-direction. Accordingly, any subject of study unrelated to the learner's social life must be rejected ([17], p. 10). For example, the study of nature concerning diversity in space, time, physical objects, living organisms, and geography will not benefit the learner if they do not help them understand social life. In the same vein, literature serves the learner's interests better when it is made the interpreter of

the learner's social life. Dewey states that these important contents of science and humanities ought to "follow upon and not precede" social experience ([17], p. 10).

Further, disassociating history from the learner's social life places it in "the distant past," making it "dead and inert" ([17], p. 11). The learner gains more from the study of history when it is presented as a record of the development of social life. Similarly, it is expected that the curriculum will connect language to the social life of the learner. As a "social instrument," language is the channel by which the learner shares thoughts in his or her social relations ([17], p. 12). When it is detached from the social experience of the learner, "language loses its social motive, and end" ([17], p. 12).

Engaging learners in "social activities" connects the subjects to the social experience ([17], p. 10). Through these activities, the learner becomes aware of the ongoing social heritage and values of his or her community. Social activities in the curriculum build on what the learner has already been introduced: cocking, sewing, and manual training. They give a social element to the educational process and are foundational to developing essential skills that make learners participate in social life.

To this end, Dewey rejects the practice of subject/course successions ([17], p. 12). Subject/courses succession is reserving some courses for more advanced stages in the learning process. Instead, he advocates for the early inclusion of all the components of social life to the learner. He claims, "if education is life, all life has, from the onset, a scientific aspect, an aspect of art, and culture, and an aspect of communication" ([17], p. 12).

The curriculum cannot serve its real purpose with course/subject succession. Instead, Dewey believes the curriculum should be "a continuing reconstruction of experience" ([17], p. 13). This reconstruction would measure the learner's development of the "attitudes" and "interest" in his or her social experience ([17], p. 13).

3.4 Method

For Dewey, method refers to the orderly development of learners' responses to social experiences. The learner manifests progressive control of his or her social experience through personal competencies and interests. For this reason, the right approach to education is a focus on activity. This is because "conscious impression" emerges from "expression" ([17], p. 13). When the learner is introduced to activities, he or she forms ideas "intellectual and rational processes" that assist him or her towards a "better control of action" ([17], p. 14). Activities induce reasoning and basis for reasoning and judgment that the learner uses to bring order into his or her social experience: "reason is primarily the law of order and effective action" ([17], p. 14). Without activities, the educational process makes the learner passive. Such passivity produces "a mass of meaningless and arbitrary ideas" ([17], p. 14).

Again, the right approach to education must put personal images into proper focus. Images are valued when the learner forms/creates them from their engagement with reality. Accordingly, the right approach to education is to equip learners to create personal images of their social experiences.

Further, authentic education will make learners' interests in the educational process a priority. Interests are foundational to learners' progressive responses to reality—they are the window into the learner's store of competencies. Focusing on these interests predicts the direction of the learner in the educational process. It virtually makes the learner lead the way to self-development. When interests are prioritized, it produces an "intellectual curiosity and alertness" that predicts the learner's development ([17], p. 15).

Moreover, the correct approach to education will create an environment in which emotions follow from actions. Dewey believes sentiments are the automatic results

from action and that by establishing or generating habits of beneficial social action, the learner will automatically generate good emotions. Reversing the relation between actions and emotions is to introduce sentimentalism into the educational process. According to Dewey, sentimentalism is worse than the combined effect of "deadness and dullness, formalism, and routine" of failed education ([17], p. 16).

3.5 School and social progress

Dewey sees education as the proper means to "social progress and reform" ([17], p. 16). Authentic education imbibes the orderly evaluation of societal values, leading to reconstructing and applying these values for societal advancement. There are two dimensions to this end—individualistic and socialistic. While the individualistic factor focuses on personal character development for "right living," the socialistic component aims at the "right character" in the context of community life ([17], p. 16). These two dimensions combine to make ethical living the ultimate end of the educational process. When the school furthers the attainment of moral duties of the community, the larger society is equipped to regulate and "formulate its own purposes...organize its own means and resources, and thus shape itself with definiteness and economy in the direction in which it wishes to move" ([17], p. 17).

It should be the aim of the larger society to provide resources for authentic education as it will inure societal development. Schools should use the "human experience" as a focal point to organize the arts and sciences ([17], p. 17). The proper relationship between the arts and the sciences will assist learners in regulating their prowess and make them understand reality and the conscious "organization of individuals" in society ([17], p. 18). The combination of arts and science will result in "the most commanding motive for human action...the most genuine springs of human conduct aroused, and the best service that human nature is capable of" (X). To this end, the teacher's duty is the "formation of the proper social life" ([17], p. 18). The larger society must motivate teachers to target "the maintenance of social order and the securing of the right social growth" ([17], p. 18).

4. Discussions

Dewey thinks it is impossible to "foretell definitely just what civilization will be twenty years from now" ([17], p. 6). He argues that education cannot train individuals for "any precise set of conditions" in the future ([17], p. 6). Such impossibility in predicting the future of society could have been valid during Dewey's era. At the turn of the 19th century, political and socioeconomic realities set in motion several uncertainties. The inability of science to fulfill its promise to society paved the way for the "law of chance" ([18], p. 116).

Socioeconomic conditions are different in the 21st-century. A knowledge-based information economy requires society to work towards the mastery of controlling and understanding the elements of nature to enhance human life. Education today has translated this quest into STEM education. These STEM elements have been structured into socioeconomic goals—Sustainable Development Goals (SDGs). Hence, society can predict its direction in the future.

Dewey might be limited in knowing the future direction of society, but his ideas on education as preparation for life is as accurate today as when he wrote these words: "to prepare him for the future life means to give him command of himself; it means to train

him that he will have the full and ready use of all his capacities; that his eye and ear and hand may be tools ready to command, that his judgment may be capable of grasping the conditions under which it has to work, and the executive forces be trained to act economically and efficiently" ([17], p. 6). Proper education will prepare all learner's senses to contribute to the present and future advancement of his or her society.

While the call to make education respond to current conditions is critical, a complete disassociation from future realities may not be helpful to both the learner and the larger society. The legacy of experience that forms the core of education has past, present, and future dimensions. Society aspires to advance towards determined goals. These goals must be incorporated into education to equip learners with the skills and courage to respond to systemic changes of both the present and future life. Education must indeed prepare learners for life, but it is also true that societal life includes aspirations towards comprehensive advancement.

Dewey's experimental/progressive educational ideas have been criticized for insufficient foundational knowledge and academic skills. Theory supports practice/experience and to emphasize the latter to the utter neglect of the former creates a gap in the process of education ([19], p. 287). Prior interactions with reality have produced detailed literature that establishes a context for the learner ([19], p. 132). This literary context provides a framework that underscores the source, context, and aim of the subject matter and the entire educational process. Nathalie Bulk correctly stated that "cognitive development must depend on reflection and social interaction from concrete problematic situations" ([20], p. 603).

Theories give directives on what has been done and what needs improvement in a given discipline. Ignoring these established theoretical concepts implies isolating experience/practice from those theories that birth and direct them. Unfortunately, Dewey's experimentalism is built on a "functional separation, in the understanding of meaning between observed or experienced phenomenon and theoretical constructs" ([20], p. 575).

Dewey has also been accused of creating an educational process that undermines school authority and organization ([21], pp. 29–30). Experience has varied contents, and it needs to be organized appropriately to be relevant to the learner's context. This implies a sort of order in the school setting. The relevance of order to the overall educational process attests to the teacher's role in the school. Teachers' personalities, attitudes, and didactics cannot be detached from the learning process. They unconsciously influence the content of the exchanges in the teaching and learning process. To some extent, teacher factors make learners' experiences actionable.

Undermining teachers' authority in the school through an incautious focus on the learner's experience is likely to introduce a level of anarchy into the school. Accordingly, Henry T. Edmondson III has blamed Dewey's educational reforms for causing teacher frustrations and general disinterestedness in education in contemporary American society ([22], p. xiv). A weaker teacher's role in the learning process would introduce some disorganization into the educational process. Eventually, this disorganization may endanger classroom management and the quest for relevance in the learner's experience. For Diane Ravitch, Dewey's experimentalism has made education anti-intellectual, "restricting learners' access to established records of human civilizations" ([23], p. 285).

With Dewey's idea of coordination between the school and the society, learners can extend such anarchy to the community. Educated individuals would undermine constituted authority by following their desire for self-preservation at the expense of social integration, cohesion, and inclusiveness ([19], p. 156). Any school that produces self-centered learners can plunge the larger society into a state of chaos.

Dewey is against the subordination or compromise of one dimension of education to the other. He argues that "if we eliminate the social factor from the child, we are left only with an abstraction; if we eliminate the individual factor from society, we are left only with an inert and lifeless mass" ([17], p. 6). Nevertheless, Dewey recommends an interpretation of the "child's capacities, interests, and habits" ([17], p. 6). One wonders how this interpretation could be made without "pressure from without" ([17], p. 4). Whose frame of reference must be used in this interpretation: society or the individual? Dewey does not address this confusing interface of the two dimensions of education in his theory. His reliance on the teacher to "select influences which shall affect the child and to assist him in properly responding to these influences" is confusing ([17], p. 9). While he forbids any imposition in the educational process, he leaves this vital task to the teacher's "larger experience" and "riper wisdom" ([17], p. 9). Chances are that the teacher's inclination to specific elements in social relationships would influence learning contents. Dewey's concept of authentic education breaks down when learners cannot connect with teacher-determined content. Nevertheless, experienced teachers ought to determine the contents of these influences based on what works in the larger society.

Though Dewey attempts to establish a strong connection between the psychological and sociological dimensions of education, much of his discourse leans towards psychological rather than sociological aspects. He claims that the learner's social context must be the key reference point for authentic education. Dewey emphasized, "experience, leaving little room for mind ideas and institutions which are at the heart of the learning process" ([24], p. 13). Dewey personalizes the educational process leaving it to the desire of each learner. Little room is given to the community in the educational process. The community only gains through learners' positive contributions to the ongoing human experience. One wonders how such an educational system can ultimately work out the collective social interest ([19], p. 238).

The community's disengagement from the educational process creates a vacuum that could be explored to reject societal values. I. B. Berkson notes that Dewey's focus on social experience is borne out of "naturalism, behaviorism, and individualism… slights moral values, since…historical traditions and communal living" produces societal values ([24], p. 13). In order to meet the exigencies of contemporary society, authentic education must balance the connection between the school and its social context in ways that are relevant to the learner's social experience.

Dewey's rejection of the practice of course/subject succession is laudable. It fits nicely into his notion that education prepares learners for life in its entirety ([17], p. 12). Learners who get an early introduction to all aspects of the educational process will likely develop and master various competencies that help them understand and control their experiences for personal and collective benefits. Succession should, however, occur in the contents of the subject. Advanced concepts in these subjects must be reserved for advanced stages in the educational process since grasping such concepts require some depth of comprehension. Otherwise, the educational process will introduce the same complexities embedded in the unconscious social experience of the learner, leading to the learner's disorientation and lack of focus.

Dewey's educational reform might have envisaged human advancement and emerging existential issues in a knowledge-based information society. He expected that the school could only be relevant to the ongoing human experience when constructed as a "miniature of society itself" ([25], pp. 506–507). However, his obsession with the overt experiences of learners limits the comprehensive role of theory and the operations of established social institutions in the educational process. Instead of setting the community as a beneficiary of authentic education, he could have equally detailed extensive role of the social context in the learning process. An application of Dewey's pragmatic theory

of education in Sub-Saharan Africa must combine the values of the African social context with higher education to assist learners in understanding their social experiences.

5. Implications and conclusion

Higher education searches for an African identity in most Sub-Saharan African countries ([14], pp. 39–40). Few higher education institutions in this region have added on the production of skilled labor for existing burgeoning industries in the society. While these expectations of higher education in Sub-Saharan Africa are essential, it is necessary to reconstruct the task of education to attend to the complex realities of the 21st-century lifestyle. Achille Joseph Mbembe [26] has quizzed, "is today's Beast the same as yesterday's or are we confronting an entirely different apparatus, or entirely different rationality—both of which require us to produce radically new concepts?"

Higher education must prepare the Sub-Saharan African learner for life in the 21st-century and beyond. It must equip learners to resolve systemic challenges such as poverty, healthcare crisis, leadership crisis, engineering, and national and human resource management. Contemporary realities present comprehensive challenges to human life. These challenges may be scientific, technical, engineering, or sociological. For example, the emergence of recent viruses calls attention to the need to survive in the phase of global pandemics. Also, technological advancement from 4th Generation (4G) to 5th Generation (5G) broadband cellular technology must be a concern for the economies of the Sub-Saharan African region. Failure to connect these concerns to higher education in Sub-Saharan Africa would continue to reverse the gains in this region. It should be the task of higher education to produce learners with ready and advanced competencies to respond to these complex realities of the 21st-century. Authentic higher education in Sub-Saharan Africa will be based on the past, but it will equip learners with the attitude to live in the present and survive the unknown but anticipated future.

The curriculum of higher education in Sub-Saharan Africa leans towards theory than praxis. While the theories are expected to positively impact learners' behavior and thinking, they are cast in socioeconomic demographics unrelated to their social context. Accordingly, these theories bear little relevance to the social experiences of learners in this region. At best, learners are required to memorize these theories and reproduce them during assessments. At worst, learners lack a deep understanding of reality and the competencies to apply these concepts in their social contexts.

A pragmatic approach to higher education in the Sub-Saharan African region would incorporate a balance between theory and praxis. This approach would assist learners in building their careers and engage them in critical thinking. Theory-informed practices would activate learners' competencies, making them significant participants in the learning process. The basis for learners' assessment will be the engaged social activities. This approach to higher learning will require learners to analyze, synthesize, and apply innovative concepts for productive ends in their social contexts. Ultimately, learners will acquire the ability to examine real-life issues from multiple perspectives, choosing solutions that advance individual and collective interests and goals.

Ensuring a balance between theory and praxis in higher education in the Sub-Saharan African region requires a change in higher education. Current instructional designs in higher education in the region dominantly center around the lecturer. In this pedagogical approach, the lecturer selects the learning contents and determines the study design and the goal of the learning process. All learners are required to

assimilate these contents, memorize them, and reproduce them during evaluation for grading. In some dotted instances, lecturers use the content-focused learning approach. Core subjects are emphasized in the learning process because they contain essential educational information, and the learner's mastery of their contents will assist them in attaining the goal of higher education.

The latest development in higher education in the Sub-Saharan African region is learner-focused learning—andragogy. Andragogy refocuses decision-making in the learning process from the lecturer to the learner. Learners' social experiences influence the contents, design, and goal of the educational process. While andragogy provides a collaborative approach to higher learning, unconscious and unorganized social experience may overwhelm the learner, leading to disorientation.

A pragmatic theory of learning emphasizes heutagogy within the broader andragogic approach. Heutagogy is self-determined learning with a strong focus on the learner's independence, competencies, and attitude ([27], p. 56). Heutagogy invests learners with lifelong learning skills that prepare them to productively navigate through the complexities of their social experiences ([28], p. 381). The lecturer serves as an academic coach, who may be called upon per the learner's needs. Learners discover the content, design, and goal of the higher educational process ([27], p. 56).

The heutagogical approach requires learners to determine problem areas in the subject and explore their social contexts for solutions ([29], p. 135). This approach transforms learners from a state of positivity to activity, with higher-order thinking and attitude that will make them useful in their social contexts ([30], p. 129). Some educationists have identified competency-based curriculum (CBC) as a model within heutagogy. Charles Ong'ondo described the CBC model as "outcomes-based rather than content-based. It is certification-based on demonstrated learning outcomes. The focus is not on knowledge for knowledge's sake, but on how that knowledge can be applied" (cited in [31], n.p.).

The gulf between higher education institutions and the larger social context in the Sub-Saharan African region must be closed to adopt the heutagogical learning strategy. The unrelatedness of higher education to the larger social context continues to affect authentic higher education in the region adversely. Higher education institutions and the larger society have varying views on the task, contents, goals, and design of higher education and the problems, goals, and developmental strategies of the larger society.

A pragmatic theory of education will provide the avenue for connecting society's goals, problems, and strategies to the task, contents, goals, and design of higher education in the Sub-Saharan African region. In this collaborative paradigm, higher education institutions and industries will develop academic content and determine the employable skills and attitudes learners must possess to fit into the corporate society. The industry-academia collaboration will also point to a store of critical, innovative ideas and models for the burgeoning industries in the Sub-Saharan African region. Market-driven learning designs, work-based internships, tracer studies, and grants for priority academic/industrial fields will facilitate the inclusion of business-like decisions and strategies into the contents of the higher educational process ([32], p. 63).

A quality higher education in the Sub-Saharan African region cannot be achieved solely by the efforts of higher education institutions. Governments of the larger society have essential roles to play in reconstructing higher education to meet the exigencies of the knowledge-based information economy. Governments in the region must implement the various policies and strategies they have designed on higher education. These policies must empower lecturers and administrators of the higher education institution to work towards authentic higher education. Policies on higher education must target raising the standard of quality faculty through lifelong learning opportunities such as sandwich,

online, and distance learning programs. Governments must ensure that faculty work in attractive and invigorating higher education environments. Especially, faculty must have access to fast broadband internet connectivity and open learning resources.

Further, governments must enforce regulatory efforts and accreditation requirements on entry, contents, delivery, staffing, exit, and management of higher education through their agencies. The establishment and maintenance of quality assurance mechanisms across higher education institutions will significantly boost higher education in the Sub-Saharan African region.

A knowledge-based information economy requires learners with higher-order thinking and attitude. The Sub-Saharan African region has been longing for high stock of individuals with these attitudes and abilities. It expects higher education to produce a stock of human resources with the ability to analyze, synthesize, and apply innovative concepts in their social context to advance society's goals and strategies towards development. However, higher education in the Sub-Saharan Africa region falls short of this target. A reconstruction of higher education in the region along the lines of pragmatic educational philosophy would be promising. In *My Pedagogic Creed*, Dewey's pragmatic views offer a paradigm for reforming higher education in the Sub-Saharan African region. Its strong emphasis on social activities within the social experience of the learner must be balanced with the values of the learner's larger social context and empirical theories to create authentic higher education that produces a labor force to move the larger society towards its developmental goals and strategies.

Author details

Daniel Dei
Valley View University, Accra, Ghana

*Address all correspondence to: dei.daniel@vvu.edu.gh

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Techno Pedagogical Applications in the Context of Remote Learning - Case Studies and Best Practices in Higher Education

Ajitha Nayar

Abstract

The pandemic has necessitated teachers to open up to the pedagogical applications of technology. The hand held devices that were until then, the only means of communication and casual conversations among informal communities, became vital modes of information delivery in the learning place. Teachers were caught off-guard by what was required of them and how they could make use of the resources at hand. Many institutions were not able to identify adequate trained manpower who could help them at that juncture. Looking back we can see that studies went off uninterrupted and courses were not delayed. It is heartening to see that, the pandemic, though it effected the lives of many sections of the society, education was least effected due to the pedagogical applications of technology, the availability of hand held devices and the net connectivity. The chapter draws upon, first hand experiences of teaching faculty of higher educational institutions and highlights the techno pedagogical case studies that have been deployed in the context of remote learning in the wake of the pandemic.

Keywords: techno pedagogies, remote learning, higher education

1. Introduction

The year 2020 was an year when teachers were forced to make use of handheld devices to reach to their young and adult learners. Though, the accessibility and availability of technology was ensured in many countries, how these could be used in teaching and learning were left to the resourcefulness of teachers and learners alike. After three months of close downs and lock downs it almost was realized by both the teachers and learners that the academic year was not going to be delayed or lagged and that they had to complete the prescribed syllabus. Many teachers admitted that they were caught unawares in their handling of techno pedagogies. It was alright to teach about and lecture about pedagogical applications of technology but it was a different issue when it comes to implement these in the actual classroom situations. Most teachers did not know about learning management systems and many institutions did not have the support of learning management systems like Moodle. The most handy

techno pedagogical support that they had was zoom and to some extent Google classroom. The earlier classes were plain video lectures and students were given assignments and activities to be completed on the day the topic was learnt. Many teachers had reported that, the fact that, they could not see their students made their teaching very mechanical and lecture oriented. As it is often remarked by teachers, that a nodding head in front of them is a stimulus to teachers to proceed, pause or rewind their presentations. It was lamented by teachers that the devoid of the actual participants before them had made teaching very unidirectional and very monotonous.

The best practices with regard to traditional face to face and remote teaching is the level of engagement of the learner. Research studies have revealed that students realize learning outcomes when the class has involved multidisciplinary and multisensory teaching. This helps to make use of all senses to reinforce the learning and concepts are associated with the different aspects of a concept. All this makes the concepts steadfast and solid foundation to the concepts.

In a traditional classroom, student engagement is ensured by an interesting introduction. Many teachers resort to anecdotes, stories and historical facts related to the topic under discussion to stimulate interest and sustain the attention of students. While learning is remote, the task of the teacher becomes quite difficult if the teacher is not competent in use of digital resources and pedagogical tools.

2. Student engagement through Techno pedagogical applications

The attributes of effective learning are retention of concepts and capability to apply the concept learnt in new and contrived situations. Effective learning can be contributed by enhancing the level of student engagement in the classroom. Student Engagement has been reported to be associated with behaviors, cognition and emotion [1].

Engagement can be assessed by level of paying attention, focus on the class activity which can be monitored by, ability to respond, participation in discussion, answers to questions, solving problems. In the traditional classroom physical proximity between the teacher and students enable recognizing facial expressions, expressions of acknowledgment, understanding, appreciating and nonverbal cues like nodding, shaking head, frowning, expression of anxiety, doubt, lack of comprehension, excitement, happiness, boredom, disgust, disengagement, engagement, level of involvement and level of participation [2].

Active student engagement is a critical factor that significantly influences students' learning and deepening understanding during online education. Many learning frameworks have been developed and experimented upon on levels of Student engagement [3–5].

2.1 Digital tools for introduction

Introductions play a significant role in the online classroom, just as in the traditional classrooms. Introducing concepts in new topics need to be made interesting to sustain student attention and ensure students are focused in the topic under discussion. Introductions need to be interesting and capture the attention of the student. Topics can be made interesting by the following mechanisms:

1. Making the subject relevant by highlighting the various applications of the concepts in the real world

2. Making the subject interesting by associating it to related areas

3. Putting across probing questions that are thought provoking and stimulating flow of ideas

In an online classroom teachers can use a host of web based resources to sustain the interest in the topic. In one of the case studies, the instructor used short videos to introduce the subject and there were question and answer sessions based on what was observed and seen in the video. This ensured responsible and attentive viewing of videos by the students. Digital story telling enables stimulating interest in the topics being handled. Interesting techniques to introduce the sessions depends on the resourcefulness of the instructors.

Teachers need to share their screen for teacher inputs, writings, power points and points for discussion. This will enable toning down on the monotony of one way lecture by the teacher. This give avenues for interaction from students and opportunities to clarify doubts and get further explanations.

Various web conferencing tools provides teachers the opportunity to diversify modes of information delivery through video lectures, video recordings of lecture, screen share, power point slides. These provisions are available in all learning management systems viz., Moodle which enables laying down the course plan, course materials and students can also upload and download their submissions for assessment. The video platforms like Zoom, Google classroom and Microsoft teams serves as video/audio platforms enable two way verbal and nonverbal communication of ideas and information.

2.2 Digital tools for discussion

The online environment is also ideal for holding synchronous and asynchronous, discussion Forums provided teachers are familiar with the facility available in various learning management systems. After presentation and explanation of basic and higher level concepts, engaging students in discussions help to identify misconceptions and highlight the significance of the concepts in real world contexts. A topic related to real world problems when given to discuss by students will invoke divergent ideas and help to stimulate innovative thinking, instilling creativity and resourceful thinking. Discussion forums when held online encourage whole class participation provided the students have an average understanding of the topic under discussion and the topic is interesting and found relevant to current times.

Discussions and debates are useful learning activities that may be done in groups. The recordings may be viewed by the teacher, later for review and assessment Discussions may be held in the synchronous classroom or in the asynchronous mode. For effective discussions, it is imminent that the topic has been introduced and a reading activity has already been completed by the students. Only then the foundation becomes solid for raising arguments and providing insights. It is also necessary that effective discussions requires participation of all and requires an equal playing field. If the discussions are led by only one or two, it becomes a one way interaction [2].

Zoom breakout rooms have become a major feature of any remote teaching. Combined with other interactive tools or shared documents, they allow students to discuss and explore ideas with friends and classmates.

Whether online learning is synchronous or asynchronous, students not only enjoy the chance to work together on tasks and projects but also benefit immensely from the interactions that discussion provides.

If they record their video interactions, they can engage in more discussion without worrying about noting down all of the details as they will have a resource for revision at a later date [3, 4].

Best practices in online discussion forums which enhances student engagement prescribe and let students be aware of the objectives of the discussion forums.

- Information with regard to the grades to be assigned and the criteria for assessment should also be elucidated before the onset of the discussion

- The vital points that need to be included in the discussion need to be clearly listed

- For the discussions not to be a talk shop, it needs to be drawn from two three questions which need to be addressed by the students and these need to be communicated in advance in the course plan itself so that sufficient time is given to students to prepare

- It is also necessary that the points that came up during discussions are highlighted in the forums and are addressed in the classroom. Whole Information with regard to the grades to be assigned and the criteria for assessment should also be elucidated before the onset of the discussion

- The vital points that need to be included in the discussion need to be clearly listed

2.3 Online collaboration

Technology offers plenty of opportunities for collaboration with members of the academic community, researchers, experts, practitioners and workplace professionals. These collaborations and network contribute to enhancement and enrich the scope and prospects of the students, especially in higher education. The future workplace is one of collaboration and requires one to be a team player rather than a lone path maker. There are many collaborative tools which encourage to team with and invite peers or members of the community for sharing information, review of literature, discussion and inputs of comments, opinion, structuring and developing models in unison. These enable to work synchronously and ensures active participation with the focus on doing rather than mere talking. It facilitates results and reinforce learning in a short span of time.

Online collaborative tools are web-based tools that enable teachers and students to perform a wide range of tasks, such as interactive discussions, online collaboration activities, sharing and accessing electronic learning resources, and many more others (**Figure 1**) [4, 5].

GitHub is where over 73 million developers shape the future of software, together. Contribute to the open source community, manage their Git repositories, review code like a pro, track bugs and features, power their CI/CD and DevOps workflows, and secure code before they commit it [6].

Slack in Higher Education gives students what their prospective careers hope to work them on and make them career ready. Gives them insights to problems prospective employers are working on and interested in and also the solutions they are looking for. It also gives a peep to the prospective work environment Slack is where the future works [7].
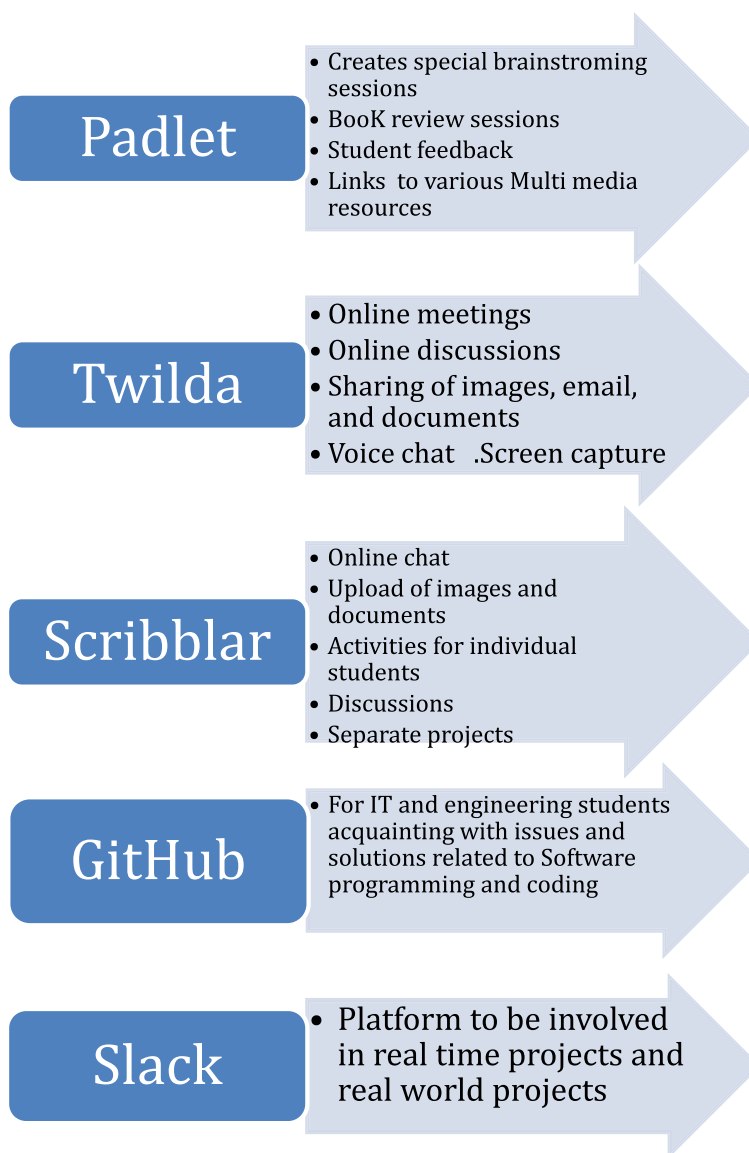
Padlet
- Creates special brainstroming sessions
- BooK review sessions
- Student feedback
- Links to various Multi media resources

Twilda
- Online meetings
- Online discussions
- Sharing of images, email, and documents
- Voice chat .Screen capture

Scribblar
- Online chat
- Upload of images and documents
- Activities for individual students
- Discussions
- Separate projects

GitHub
- For IT and engineering students acquainting with issues and solutions related to Software programming and coding

Slack
- Platform to be involved in real time projects and real world projects

Figure 1.
List of online collaborative tools that provide opportunities for students to engage in teamwork.

3. Case studies

These case studies emerge from feedback received from practioners comprising of teacher educators, pre service teachers and teachers of higher educational institutions based on their deployment of techno pedagogical practices in their classroom.

The chapter draws upon first hand experiences of teaching faculty of higher educational institutions and reveals the techno pedagogical case studies that have been deployed in the context of remote learning in the wake of the pandemic.

This research paper collects feedback from teaching faculty of teacher educational institutions. The sample also comprised of pre service teachers of select teacher

educational institutions the feedback was collected from teacher educators (N1 = 18) through handouts with regard to details of pedagogical practices deployed by them for teaching the topic entrusted to them. The handouts listed the details that were to be described viz., topic outline, phase of the instruction, instructor activities and student's activities, applications and online resources used, details of teaching/learning online platform. Data was collected from handouts administered to the participants comprising of teacher educators (N1 = 18) and pre service teachers (N2 = 67) in March 2021. Both the teacher educators and pre service teachers were associated with teacher educational institutions of a state in India.

A panel of experts comprising of senior teacher educators with more than 25 years of experience in teaching and administration participated as experts and rated the inputs of teacher educators and pre service teachers for identifying the best practice based on the following criteria:

i. Whole class participation ii. Level of interaction iii. Multimedia presentation iv. Multiple pedagogical applications v. Activity based instruction.

Demographic aspect	Description	Sample size
Age,	>45	7
	30–45	11
	<30 and above 20	67
Seniority,	Senior level	7
	Middle level	11
	Junior level	67
Branch (art, science etc.),	Education	85
Course name	Education	85
Course level,	Graduate course education	85
Date of feedback.	02-03-2021	

4. Best practices

The best practices for remote learning and Technopedagogical applications point out to being identifying the rightful resources and resorting to value and respect the time allotted for the lesson. Judicious selection of activity and timely remediation of difficulties that are encountered is essential to boost and sustain student presence in class and attention to topic.

The best practices were selected based on the description of the lesson plans submitted by the participants. The best practice for each context- introducing, learning, explaining/presenting, and concluding and assessment – was identified based on the criteria of level of student engagement, use of multiple resources and level of student activities imparted. The following figures gives the details of instructor and learner tasks for each context (**Figures** 2–5).

4.1 Identification of digital tools

There are a host of digital tools and only few are relevant and ideal for Higher education. The digital tools most compatible with the level of the learners need to be deployed. Sticking to one online web platform for lecturing, interaction with students
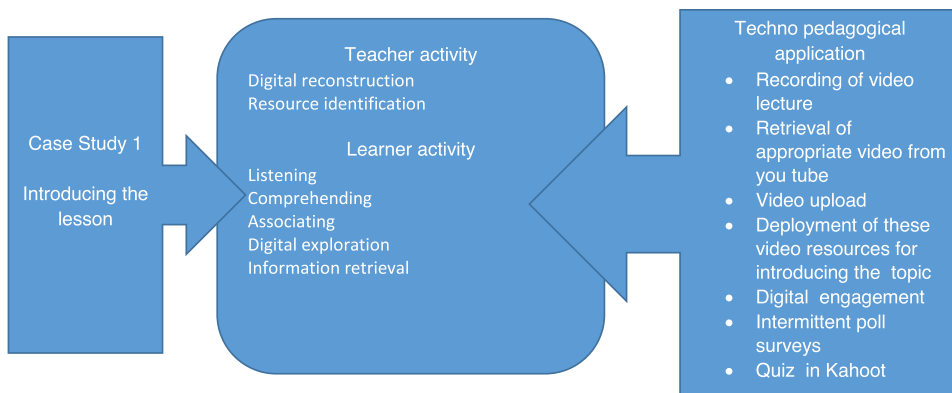
Figure 2.
Case study 1: Techno pedagogical applications while introducing the lesson.
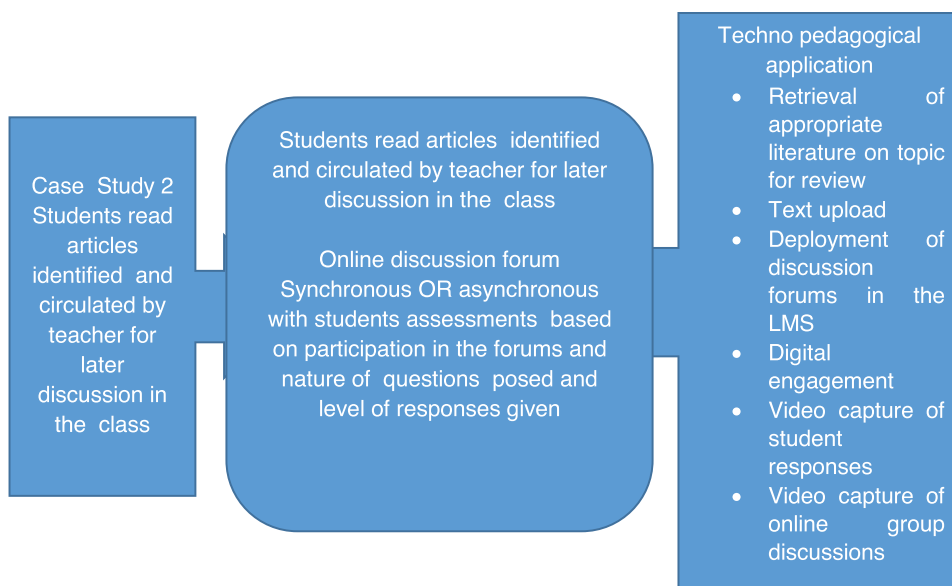
Figure 3.
Case study 2: Techno pedagogical applications while planning a discussion on topic.

and class room activity makes both teacher and students increase their level of comfort in the chosen topic. It is best that an institution focuses on a particular leaning management system for all the courses. This provides ease of access and ease of use to the students. However, the digital tools used for instructional activity may be at the discretion of the instructor and will rely on the resourcefulness of the instructor. Such successful practices and interventions need to be communicated and shared with other members of the teaching community in the best interest of the student community.

4.2 Selection of appropriate digital resources

For the introductory lesson and for introducing concepts, digital resources that are identified need to be easily understandable and comprehended by the learners.
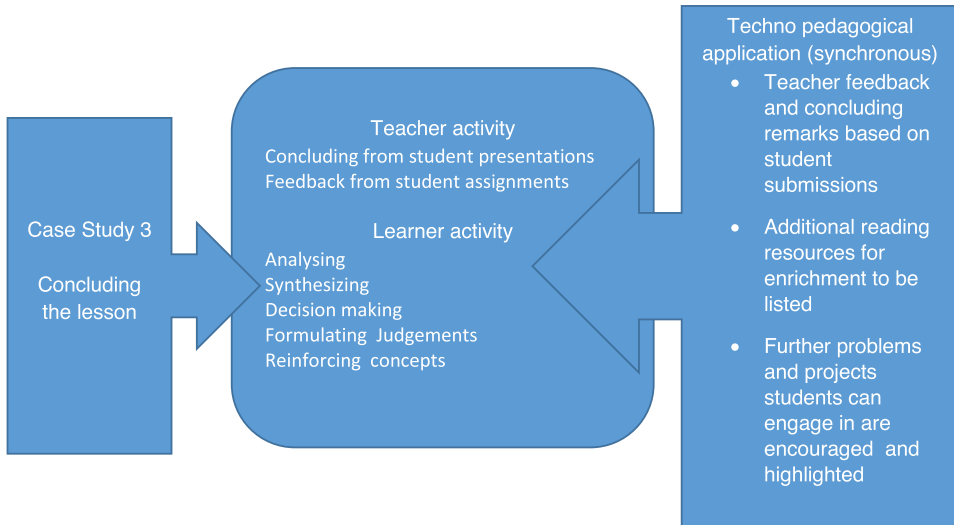
Figure 4.
Case study 3: Techno pedagogical applications while concluding the lesson after all student activities and student assessments.
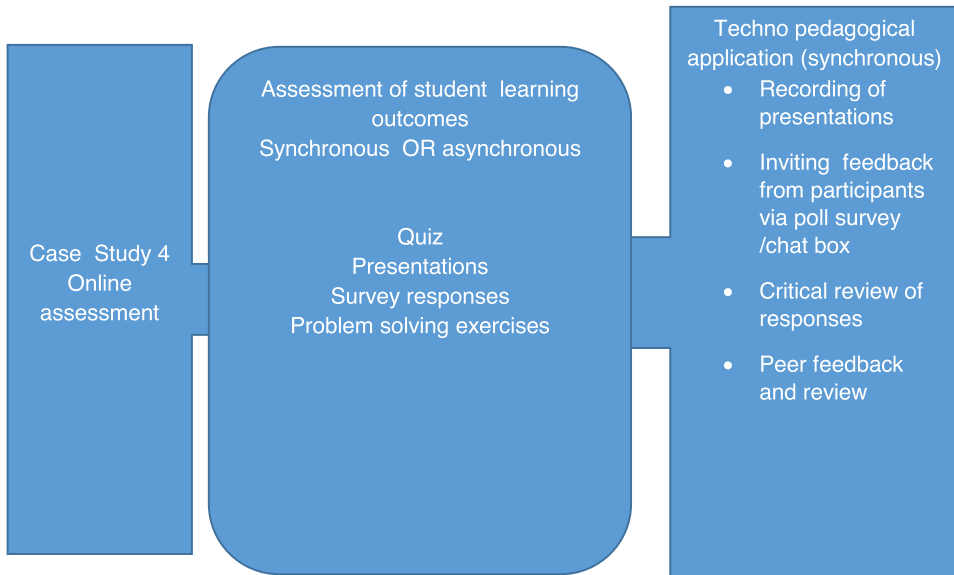

Figure 5.
Case study 4: Techno pedagogical applications while assessing students.

These in itself should be interesting and engaging so as to enable sustained interest in the topic that is be discussed subsequently. The teacher notes also could be used as digital resources as it is likely to be in simple language and enable better understanding of the corresponding lecture. Very long resource materials which cover more than 10 pages need to be discouraged and in such contexts the page numbers highlighting most relevant and related concepts need to be indicated. The selected reading resources need to be closely corresponding to the topics to be studied and under discussion. Very

elaborative and detailed resources may be given in the concluding sessions so as to encourage students who wish to further their understanding on the underlying scope for research. Kognity is a fantastic tool because you can set reading assignments for students. The website allows you to check who has completed the assignments by a set deadline and you can assign questions to check understanding. Another tip is to create short video tutorials to allow students to work independently and to understand instructions [4].

4.3 Assessments of learning outcomes: remote learning

Limiting the mode of online assessments to select few and most appropriate for the student activity and compatible with objectives of the instruction, so that the most relevant learning outcomes are attended to. Though it is recommended to experiment with various modes of assessments, it is necessary that students are made familiar with the technology before implementation in the class. It is best to rely on cloud based tools which saves time of installing and saves disk space. However, the level of net connectivity required should not be a hindrance in use of these tools. Research shows that students learn more in active learning classes, and in fact perform better on assessments, but still feel they learned less [8, 9].

Studies have reported that Digital rubrics are an excellent way to provide meaningful and uniform feedback as a department. Online quizzes can also be assigned to provide instant feedback. Game-based formative assessment tools like Kahoot!, Quizizz, and Quizlet Live have been found to be excellent online student assessment applications [3].

5. Communications to students: tips for teachers

Derby, Flora (2017) has listed the following tips for teachers resorting to teaching in remote mode

- Talk to your students just as you are in the classroom

- All class and instructional activity need to be shared and informed well in advance so that students can pace their instructional tasks well ahead

- Teachers need to post end of the week announcements so as to brief and remind students activities for the forthcoming week and draw attention to what is expected and what needs to be completed before the onset of the next session

- All instructions needs to be clearly spelt out and step wise activities to be detailed vide mail or in class announcements in the LMS

- During the pandemic many teachers resorted to WhatsApp groups which facilitated better sharing of information and timely communication of decisions

- Timely feedback to students needs to be taken care of. In large classes with student strength above 30 a teaching assistant or research assistant may be used for sending communications.

- Setting appointment times for the students who need help or advice needs to be arranged and initiated by the teacher

- Teachers need to respond to the questions posted in chat box and provide timely responses

- Grade and return students' work in a timely fashion.

6. Discussion

The case studies described here are pointers to feasible and practical solutions to instructional strategies that are deemed suitable for remote teaching and learning contexts. The fact that these were implemented by teacher educators and pre service teachers reflect their ease of deployment. The case studies were identified as best practices based on the select criteria.

Case study 2 highlights a lesson where a topic is introduced. A topic where students do not have any background knowledge. The strategies used for making it as interactive as possible with considerable level of student engagement is by making available recording of lectures, exposure to multimedia content on YouTube [10].

Case study 3 highlights Techno pedagogical application comprising of student activities which encompasses blended learning. Learning of the topic commences before the assembly of students and teachers. Making use of videos and audio for capturing live discussion among students engage interest and sustain different modes of student assessments through poll surveys and quizzes. Studies have reported similar applications in higher education learning contexts [3, 11, 12].

Case study 4 highlights Teacher activity on concluding a topic and imparts additional resources for reading to reinforcing learning. The remote teaching/learning platform provides contexts to the teacher to deliver concluding remarks and stimulate students to comment on the further applications of the topic. It also provides scope for students to explore current developments on the topic and direct attention to real world problems related to the topic [10, 12–14].

Case study 5 reports on teacher activities that occur also in traditional classroom activities. But, these are assessments of submissions of students uploaded on online platforms viz., Moodle, Mail, Google classroom. There are AI applications which can assess the student submissions too based on text analysis whereby saving time for teachers. Activities like recording of presentations, Inviting feedback from participants via poll survey/chat box, Critical review of responses, Peer feedback and review provides opportunities to learn from the mistakes and correct responses of peers [3, 10–14].

7. Conclusion

The activity centered classroom of remote learning mandates multi learning and multi instructional tasks. Verbal and nonverbal cues are not observed in such classrooms so teachers need to plan and design activities to sustain the interest and attention of students. What is required of teachers is to judiciously use and select the most appropriate digital resources and tools which takes into consideration constraints of time, net connectivity and class size. Teachers need to take time to plan and acquire competency in deploying these tools for remote learning in the best interest of students.

Author details

Ajitha Nayar
Kerala University of Digital Science Innovation and Technology,
Trivandrum, Kerala, India

*Address all correspondence to: ajithanayar@gmail.com

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Chapter 31

Critical Reflection on the Pedagogical Science Training for Higher Education Institution Teachers Program in Ethiopia: Successes, Failures, and Prospects

Robsan Margo Egne

Abstract

The core intention of this study was to critically reflect on the successes, failures, and prospects of the Higher Diploma Program or the Pedagogical Science Training for Ethiopian Higher Education Institutions' Teachers program. This program was designed mainly to introduce concepts such as being reflective teacher, active learning, continuous assessment, action research, and higher education institution-industry linkage to instructors who are teaching in the country's higher education institutions. This means public and private higher learning institutions' instructors are expected to pursue this training to deliver quality education through identifying the learning needs of their students. Hence, this research was committed to figure out the successes, failures, and prospects of the program in terms of enhancing teachers' continuous professional development in Ethiopian higher education institutions. To this end, discursive qualitative content analysis was used in the study. Results of the study revealed that although the Pedagogical Science Training for Higher Education Institutions' Teachers program was introduced since 2003, effective continuous professional development practices have been hardly reflected in the higher education system of the country. Implications, which are assumed to enhance the instructors' effective engagement in the Pedagogical Science Training for Higher Education Institutions' Teachers program, are forwarded in the paper.

Keywords: higher education, pedagogical science training, prospect, reflection, success

1. Introduction

1.1 Background of the study

The performance of employees is critical to the survival of organizations. Likewise, the performance of teachers is one of the key factors determining school effectiveness and efficiency in terms of ensuring students' learning outcomes [1]. It can be argued that

teachers are the backbone of any education system implying that educational resources and some other school-related activities are useless in the absence of well-educated and committed teachers [2, 3]. Teachers can make or break a nation, as they are the backbone of the education system. Nothing can substitute the role of good teachers in building a nation as they are at the forefront in ensuring the quality of education.

Therefore, for quality of education to be realized in any education system, great attention should be given to teacher education i.e., teachers' recruitment, training, assignment, and engagement in on-job-training or continuous professional development. Teachers' performance is the most crucial input in the education sector [4–7]. Therefore, for teachers to accomplish their responsibilities of assisting students to acquire the necessary knowledge, skills and values, it is important to engage them in continuous professional development programs [8–10]. Hence, it is in light of the above argument that the government of Ethiopia has started offering the Higher Diploma Program or the Pedagogical Science Training for Higher Education Institutions' Teachers program since 2003 in connection to the introduction of the Teacher Education System Overhaul (TESO).

The Pedagogical Science Training for Higher Education Institutions' Teachers program has been launched believing that pedagogy is a cross-cutting issue in all disciplines to improve the quality of education. Therefore, all educational institutions should find means through which the teachers teaching there get an in-depth awareness about pedagogical science theories, principles, and practices. This, in turn, is important to apply active learning to enhance the learning outcomes of students via addressing their diverse learning styles [11].

To produce productive and happy citizens, teachers must be equipped with a keen knowledge of the subject matter(s) they teach and at the same time, they must have sound knowledge and skills of pedagogy [2]. In this venture, pedagogy has a great contribution to the holistic development or well-rounded development of a student i.e., it has a great contribution to the development of the head, hand, and heart of the learner in a balanced manner. This, in other words, means the proper application of interactive pedagogy enhances the cognitive, psychomotor, and affective development of the student.

Quality education is a basis for a well-rounded development of society [3]. In the efforts made to ensure the quality of education, pedagogy has immense contributions. Having in-depth knowledge and skills of pedagogy is very important for teachers to become reflective professionals who can identify their strengths and weaknesses and thereby improve their limitations [12]. Sound knowledge of pedagogy is also important for teachers to apply learner-centered teaching methods rather than applying the teacher-centered teaching methods [2]. In addition, having adequate knowledge of pedagogy is very important for teachers to use continuous assessment instead of using a single assessment technique in assessing their students' learning outcomes.

Similarly, getting adequate awareness of pedagogy helps teachers to conduct relevant applied research in general and action research in particular that helps to solve immediate teaching and learning-related problems. Besides, keen knowledge of pedagogy helps teachers to create positive and sustainable linkages with students' parents as well as with some other relevant stakeholders.

Pedagogy is also important for educational leaders to properly lead and/or guide the teaching and learning processes. In this regard, in-depth knowledge of pedagogy can help the leaders to understand the fact that education is a double-edged sword. This is because it is the most powerful tool to liberate and empower people [13, 14]. At the same time, unless, great care is taken, education can be used to dominate and exploit the disadvantaged group(s) in a convoluted manner.

Currently, the Ethiopian Ministry of Education has given great attention to pedagogical science training via the program called Higher Diploma Program. However, as can be understood from the nomenclature of the program, there is a mismatch between the contents incorporated into the training package and the nomenclature given to the program. Therefore, there is a need for adjusting the nomenclature to the contents it is meant to address. To this end, instead of calling the training package as 'Higher Diploma Program,' which is quite generic, it is better to designate it as 'Pedagogical Science Training for Higher Education Institutions Teachers' program. Moreover, to make improvements to the contents as well as the delivery of the 'Higher Diploma Program,' it is important to analyze its strengthens and weaknesses.

Realizing the above-intended improvements require research-based evidences. In other words, there is a need for conducting a study upon the degree to which the current Higher Diploma Program has brought improvements in terms of enhancing life-long learning, teachers' professional development and success in Ethiopian higher education institutions. In doing so, it is necessary to identify the strengthen and the drawbacks of the program thereby suggesting ways through which the program could be improved. Nonetheless, although I have served as the coordinator as well as the facilitator of the Higher Diploma Program at Arsi University, Ethiopia since 2016, to the best of my knowledge, there is no rigorous study that looked into the effectiveness of the program in terms of fulfilling its intended purposes. Therefore, this curiosity-driven study intends to figure out the degree to which the program is effective in enhancing instructors' continuous professional development and success in offering quality education to their respective students.

1.2 Statement of the problem

In Ethiopia, formal teacher education started for the first time in 1944 with the launching of a primary school teacher education and training program in the premise of Menelik II School in Addis Ababa through the assistance of the British Council [15]. Nevertheless, a fully-fledged teachers training institute was later inaugurated at Gulale in Addis Ababa in 1946/47 [16]. This particular time marks the beginning of a period of reform in the teacher education system of the country.

In Ethiopia, secondary education is expected to be taught by teachers who have a first degree in their respective disciplines [17]. When it comes to the secondary teacher education program, from 1994 to 2002, it was a four-year program. Nevertheless, with the introduction of a new teacher education policy called Teacher Education System Overhaul (TESO), which initiated a wide-ranging reform in the Ethiopian teacher education sector in 2003 [18], the secondary teacher education program was reduced from four to three years.

In TESO, it is argued that Ethiopian teacher education institutions have to play an initiating role in the teacher education paradigm shift. The reform proposals presented by TESO offer a direct challenge to the teacher education institutions, in the sense that it is argued to be necessary to redefine Ethiopian teachers' roles as active change agents in the classrooms, within their communities, and ultimately within the Ethiopian society [18]. The competencies that Ethiopian teachers at all levels must exhibit are assumed to guide the nature, organization and management of all programs are clearly set to serve as indicators for measuring progress towards the paradigm shift. Under TESO, Ethiopian secondary teacher education was following the concurrent model where prospective teachers were pursuing their major area courses side by side with professional courses.

Nevertheless, in 2009 the Ethiopian Ministry of Education shifted from TESO to Post Graduate Diploma Teaching (hereafter PGDT). The ministry claimed that although TESO has planted very well the culture of partnerships between schools and teacher education institutions and the relevance of active learning and continuous assessment in the Ethiopian teacher education system, the notions seem to be abused due to misconception and resistance. Furthermore, the ministry asserted [19] that the core factors that hinder the successful implementation of TESO were: misunderstandings about the program by the teacher education institutions' personnel; high level of enrolment in secondary teacher education programs which forced teacher education institutions to compromise on many useful issues of TESO; and the clash of the rhetoric of active learning and TESO's practicum program with the use of plasma TV in secondary schools.

Hence, the Ethiopian Ministry of Education replaced TESO with a new secondary teacher education program entitled PGDT where prospective teachers undergo professional courses for one year after finishing their undergraduate studies in applied disciplines [19]. The changes promoted by PGDT implied that a consecutive model has been used where prospective secondary education teachers take intensive training in professional courses for one year after finishing their undergraduate studies in applied disciplines to be qualified as teachers. The teacher education curricula of this program entirely focus on professional courses instead of offering subject matter training in parallel with pedagogical science training.

When it comes to higher education institutions, one of the measures that have been taken by the Ethiopian Ministry of Education to enhance the quality of the teaching and learning process in higher education institutions of the country has been commencing the offering of the program called Higher Diploma Program since 2003. Thus, successful completion of the program has been considered as a requirement for all higher education institutions' instructors of the country. This notion includes making the program compulsory for all higher learning institutions' instructors, making constant follow up and improving the training and its actual implementation.

Apprehending the above-intended improvements require research-based evidences. Put differently, there is a need for conducting a study upon the degree to which the Higher Diploma Program has brought improvements in terms of enhancing teachers' continuous professional development and success in Ethiopian higher education institutions is a worthwhile concern. Therefore, it is in light of the above arguments that this study is intended to critically reflect on the successes, drawbacks, and prospects of the program underway in the Ethiopian higher education institutions.

1.3 Research questions

This study aimed at answering the following basic research questions:

- To what extent is the Higher Diploma Program effective in terms of enhancing instructors' continuous professional development in Ethiopian higher education institutions?

- What are the successes registered following the offering of the Higher Diploma Program in the Ethiopian higher education institutions?

- What are the failures observed in the course of the implementation of the program in the Ethiopian higher education institutions?

- What should be done to facilitate the effective implementation of the pedagogical science-training program in the country's higher education institutions?

1.4 Analytical framework for the study

This section presents the analytical framework for the study as rooted in existing research on teachers' professional development and the subsequent successes in terms of ensuring lifelong learning. Different scholars may see teachers' engagement in the Continuous Professional Development (CPD) program and their successes in terms of enhancing students' learning outcomes from different angles at different times. However, in this study, the effectiveness of CPD particularly the Pedagogical Science Training Program for Higher Education Institutions' Teachers was seen from the five components incorporated into the program i.e., being reflective teacher, active learning, continuous assessment, action research, and higher education-industry linkage. In the following, I shall present each of the five training components turn by turn briefly.

Being reflective teacher. As it is known, teaching is a complex activity that requires making appropriate decisions [12, 20]. Even if teachers need to follow certain set ground rules to make the teaching and learning processes orderly and fruitful, only this practice may not make teachers effective and efficient. Hence, to be effective and efficient in their professional careers, teachers must develop reflective skills. Reflective action involves a series of logical rational steps that are based on a deeper understanding of the matter under consideration. This means rather than being guided by impulsive action, the teacher is guided by persistent and careful consideration of how a given activity should be accomplished [21]. This notion was interpreted in this study in terms of analyzing the degree to which Ethiopian higher learning institutions' instructors show improvements in developing consistent reflective abilities and skills.

Active learning. A teaching method is not merely a device adopted for communicating certain concepts to students and it is not exclusively the concern of the teacher who is supposed to be at the 'giving end'. This implies that a method must link up the teacher and his/her students into an organic relationship with constant mutual interaction [22, 23]. Taking the above notion as a backdrop, in this study, the extent to which Ethiopian higher learning institutions' instructors brought a change in terms of implementing active learning in their respective lessons was studied.

Continuous assessment. It is a generally agreed-upon truth that a one-shot assessment cannot give a true impression of a student's academic performance. This notion calls for the application of continuous assessment techniques. As asserted by Abejehu [24], continuous assessment is part and parcel of the instructional process that has to be taken as a key tool in educational quality assurance endeavor. These techniques are learner-centered, teacher-directed, mutually beneficial, formative, context-specific, and ongoing processes. Therefore, this claim is interpreted in this research in terms of exploring the degree to which Ethiopian higher learning institutions' instructors brought improvement in applying different assessment techniques while assessing the performances of their students.

Action research. Action research is an exercise intended to bring about change in the teaching-learning process within a short period of time [25]. As such, it involves purposefulness, reflection, flexibility, practitioner empowerment and commitment to the teaching and learning process. It is a process of problem-solving intended to improve the teaching and learning processes.

Apart from teaching and rendering community services, university instructors must engage in research works that may solve teaching and learning problems, societal problems and beyond [26]. Therefore, this notion was applied in this research from the perspective of assessing the degree to which Ethiopian higher education institutions' instructors become productive in conducting relevant action research works to solve the problems they encounter in their day-to-day teaching and learning practices.

Higher education institution-industry linkage. This kind of linkage is assumed to offer an array of benefits for the parties involved [27]. Nowadays, the Ethiopian government more than ever wants to increase the employability of the graduates of higher learning institutions of the country. To this end, it is important to familiarize the students with the real contexts of industries and/or enterprises that are the potential areas of employments for the graduates. This, in turn, suggests that it is important that university instructors must get first-hand experiences about the potential employers to prepare graduates that best fulfill the demands of the labour market [26]. Hence, this notion is conceived and interpreted in this study in terms of analyzing the extent to which Ethiopian higher learning institutions' instructors brought significant improvements in terms of creating sustainable as well as relevant collaborations with the nearby industries and/or organizations to better prepare graduates who best fit to the demands of the labour market.

2. Research methodology

In this study, qualitative content analysis particularly discursive content analysis was used as a core tool for data collection. This is because content analysis [28] is an accepted method of textual investigation. In other words, this content analysis concentrated on both the overt and latent contents of the documents analyzed [29]. Furthermore, qualitative content analysis helps a researcher to explore the meaning and realities beyond words and images [30].

In this respect, the research works made on the HDP program since its inception in the Ethiopian context, the action research works conducted on the program as the partial fulfillment of the requirements for the successful completion of the program, and reports organized on the program were critically analyzed. In addition, Focus Group Discussions, in which five key informants took part from all colleges of Arsi University, were used as tools of data collection.

3. Results and discussions

This part of the study dwells on presenting the results of the study in thematic manners. In other words, the actual discursive qualitative content analysis was made by presenting the documents analyzed consecutively. As such, in the first place, the strengthens of the HDP program were reviewed and critically analyzed.

Then, this endeavor was followed by an exhaustive analysis of the drawbacks observed to the formulation as well as the implementation of the HDP program in the Ethiopian higher education institutions' contexts. Last but not least, the way forwards are proposed. The details of each of the three thematic areas were reviewed and critically discussed, in turn, in the following sections.

3.1 Strengthens of the HDP program

The Ethiopian government promulgated a new education and training policy in 1994 to address the needs and interests of the citizens of the country through education. To materialize the changes intended by the education and training policy, various measures were taken including reforms of teacher education programs and curricula [5, 16]. One of the fundamental reforms was the introduction of the TESO program.

In TESO, it was argued that teacher education institutions have to play an initiating role in the teacher education paradigm shift. The reform proposals presented by TESO offer a direct challenge to the teacher education institutions, in the sense that it is argued to be necessary to redefine Ethiopian teachers' roles as active change agents in the classrooms, within their communities, and ultimately within the Ethiopian society [18, 26]. The competencies that Ethiopian teachers at all levels must exhibit and that are assumed to guide the nature, organization and management of all programs are clearly set to serve as indicators for measuring progress towards the paradigm shift.

As part of the strategies to enhance the effective implementation of the TESO program, the Ethiopian Ministry of Education introduced HDP in 2003. The program was launched to enhance the quality of education in the higher education institutions of the country through the professional training of academic staff. Thus, successful completion of HDP has also been instituted as a requirement for all higher education institution teachers in public universities. A series of HDP training has been given so far and the vast majority of academic staff in public universities has already completed the program. The training was conducted using handbooks that have been revised from time to time with the view to make them increasingly more relevant and appropriate for academic staff at the higher education institution level of the country.

Therefore, some of the strong sides that have been observed in the course of the offering of this program are listed below.

- Introducing the essence of being a reflective teacher, active learning, continuous assessment, action research, and higher education institution-industry linkage to all instructors who attended the program.

- Delivering pedagogical science training across the colleges, faculties or schools housed under the public universities of the countries.

- Delivering the pedagogical science training by the right professional facilitators i.e., giving the training using instructors from the College of Education or pedagogy instructors.

- Attempting to change the mode of the delivery of the training to online learning (the case of health and agriculture trainees) or blended learning.

- Managing to conduct the training without interruption or conducting the training year after year.

3.2 Limitations of HDP program

As noted above, one of the main objectives of this study was to examine the limitations of the program. Accordingly, the results of the study revealed the fact that the program has so many drawbacks and the main ones are presented below.

• The absence of a baseline for evaluating the improvements was brought about because of the pedagogical science training.

• Delay of the procurement of the necessary training materials due to the higher education institutions' administrative bureaucracies.

• Delivering the program only as on-job training or as an extended program i.e., not giving the training in the form of induction training.

• Failure of the nomenclature of the program to represent the essence of the program and the components included in it.

• Absence of a section or module that focuses on 'English for Academic Purpose'. While command of the English language is a big concern among Ethiopian university instructors, HDP training is void of such issues.

• Absence of a module that dwells on ICT.

• Making the training one-time program. No possibility of retraining the instructors who already completed the training.

• Absence of modest payment for coordinators, leaders, and tutors of the program in a uniform manner across the higher education institutions of the country.

• Irregularities in the duration of the training across the different higher education institutions of the country.

• Absence of a clear and uniform administrative structure that can effectively run the program.

• Absence of tracer study or follow-up study on the impact of HDP training in terms of improving the teaching competencies of instructors who pursued and successfully completed the training.

• Absence of fixed and well-furnished training rooms or centers for the training in the respective colleges housed in the public higher education institutions.

• Existence of weak follow-ups during candidates' placement in schools or industries.

• Not addressing Bloom's three taxonomies (cognitive, affective, and psychomotor domains) in the right way in the training.

• Not bringing the teaching loads of the HDP trainees to the minimum level i.e., six Cr. Hrs. per semester.

• Not certifying those trainees who successfully completed their training on time.

• Existence of many unnecessary repetitions in the current modules.

- The reluctance of the administration of the higher education institutions to give the right attention to the training. For instance, not considering the certificate of HDP as a criterion for academic promotion, scholarship, assigning people to different positions, etc.,

- Absence of a real reward system for the instructors who successfully complete the training.

It has been found that the HDP program has, for the first time, provided Ethiopian higher education institutions with a concrete framework that encompasses clear objectives, training guidelines, and profiles concerning being a reflective teacher, active learning, continuous assessment, action research, and higher education institution-industry linkage. However, the results of this study revealed that effective continuous professional development practices and successes have been hardly reflected in the higher education system of the country. Many researchers [31–33] have also found the fact that the higher diploma program has been ineffective in terms of ensuring the purposes it was intended for in the Ethiopian higher education institutions' contexts.

3.3 The way forward

Based on the above research findings, the following recommendations are forwarded.

- There is a need for changing the nomenclature 'Higher Diploma Program' to 'Pedagogical Science Training for Higher Education Institutions Teachers Program' to exactly match the name of the training program with its real intent.

- There is a need for establishing a fully-fledged as well as a well-furnished pedagogical training center in each higher education institution.

- The pedagogical training center should deliver well-organized induction trainings particularly for newly employed instructors before they start teaching.

- The pedagogical science training should be delivered in the form of team teaching. Put differently, in addition to delivering the training using a pedagogy specialist, one assistant trainer who has a better track record in the pedagogical science training must be assigned from the respective college or faculty to customize the training components to the subject areas of concern.

- Modest payment should be made for the coordinators, the leaders, and the tutors of the program in a uniform manner across the higher education institutions of the country.

- The existing modules must be thoroughly revised with the full engagement of some teams from the respective colleges. The members of the revision team must be off the regular duties and responsibilities. In addition, the revision team must at least consist of a pedagogy expert, subject area expert, and English language expert.

- Nationally agreed indicators against which the success or failure of the program could be evaluated should be developed.

- Inter-universities experience sharing programs must be arranged for the coordinators, main trainers as well as assistant trainers.

- Fully-fledged modules that focus on English for Academic Purpose and ICT should be included in the existing modules.

- This academic staff development program should be divided into two parts: induction training and a pedagogical science training program that lasts for one academic year.

- There should be possibilities of retraining instructors who already completed their training after five years of effective services in the teaching profession.

- The administration of the higher education institutions should give the right attention to the training. This means, apart from fulfilling all the necessary facilities for the effective functioning of the program, the leaders should consider the certificate of the pedagogical science training as a criterion for academic promotion, scholarship, and assigning people at different positions in the higher education institutions of the country.

Author details

Robsan Margo Egne
College of Education and Behavioral Sciences, Arsi University, Ethiopia

*Address all correspondence to: robsanegne@gmail.com

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Disparity in Higher Education Provision Caused by Technological Capabilities of Nations during Covid-19

Bharti Pandya, BooYun Cho and Louise Patterson

Abstract

During Covid-19, higher education institutions were forced to resort to emergency remote learning. The nations and higher education institutions with strong technological infrastructure and resources facilitated the provision of education and caused minimal interruption in teaching and learning. While the nations with poor technological infrastructure and non-availability of resources had to struggle to continue providing the education. This study, utilizing the job-demand resources model, provided insights into the influence of technological capabilities in providing higher education during the Covid-19 period and how a disparity is caused between different nations. The findings will benefit education policy developers and leaders of higher education institutions.

Keywords: pedagogical shifts, Covid-19, job demand—resources theory, disparity in higher education, technological capabilities, digital divide

1. Introduction

In April 2020, Covid-19 instigated reforms in higher education institutions (hereafter, HEI) across the world. Nations, students and faculty experienced sudden closure of HEIs' premises and resorted to emergency remote teaching for continuity in education [1]. In less than a month, educational technologies took precedence over physical learning spaces and suddenly online teaching platforms, learning management systems, and communication technologies found their place in homes. The HEIs that were in the market of distance education and online learning had to make minor modifications, while others experienced numerous challenges and obstacles to continue providing education. The HEIs, besides managing panic among the students and following government regulations, had to devise strategies to provide education. Many HEIs across 188 countries, surrounded by uncertainties caused by Covid-19, were forced to take drastic measures to deliver remote education. This meant undertaking a series of steps—exploring the alternatives to face-to-face teaching, reviewing the alternatives, selecting the best alternative within the constraints of

resources, and implementing the chosen approach. Also, developing or procuring the educational technologies and re-engineering the course delivery was another task. At this juncture, the nations with powerful technological infrastructures and the HEIs with resources survived the pandemic and continued to provide higher education. The HEIs with capabilities to procure/develop technologies, with capable faculty equipped with technological know-how to deliver remote classes, and with students owning devices and broadband connections continued to sustain. On the other hand, nations with underdeveloped technological infrastructure and HEIs with poor technological capabilities could not impart education. This created a disparity in higher education provision among different nations. The Covid-19 caused pedagogical shifts [1] and expansion in the faculty's workload (job demands). However, many low-income nations and under-prepared (or unprepared) HEIs could provide the resources needed to match the shifts. Limited literature is available that informs us about such disparity in higher education. This informative chapter discusses the shifts in pedagogy experienced by faculty during Covid 19, the disparity in higher education caused by not having adequate resources to fulfill the faculty's job demands, and the disparity caused by the technological capabilities of nations. The principles from the job demand-resources model are applied to understand the reasons for the disparity in higher education provision. A convex lens approach was used to comprehend how pedagogical shifts influenced the faculty's job demands-resources and how the provision of resources required by the faculty are influenced by nations' technological capabilities, causing disparity in higher education provision across different countries.

2. Shifts in higher education provision and pedagogical approaches during Covid-19

A plethora of research conducted during the Covid-19 pandemic highlighted that the landscape of higher education has changed where the mode of delivery shifted from face-to-face learning to either remote learning or online learning or hybrid learning. In April 2020, the Covid-19 forced HEIs to revamp the mode of education delivery, and this was the case around the world. The world witnessed the sudden closure of HEIs, governments passed a variety of initiatives and regulations, and the decision-makers at the institutional level took swift measures. Ultimately, the responsibility to continue delivering the education in an unknown learning environment cascaded down to the faculty members. The role of faculty members enlarged as teaching and learning mode during Covid-19 changed.

As posited by Pandya et al. [1], five major areas of teaching and learning were modified on an emergency basis to continue providing education—course content, the teaching methods, assessments, the faculty's preparedness and support from educational-technologies support teams. The researchers found that during Covid-19, the frequency of conducting online teaching increased, while other collaborative activities such as group discussions, games, in-class presentations, and quizzes decreased. Also, online breakout rooms, discussion boards, students' real-time feedback, and streamed events took over the learning activities. It was also noted that the delivery approach moved from faculty-led teaching to content-led teaching. The researchers noted that despite this shift, the content did not change significantly because the time to make the content compatible with remote teaching was inadequate. Furthermore, during the shift, many HEIs were already in the middle of their academic term and

changing the content was not pragmatic. Initially, while the content did not change extensively, a significant difference was noted as HEIs reduced the frequency in conducting written and oral exams, practical exams and project work. Since Covid-19 enforced such rapid changes, faculty members underwent several professional development sessions to develop their capabilities to utilize educational technologies and deliver remote sessions. For all of these amendments, support from the technical experts was highly important. Technical support here includes responsiveness to queries and requests from the faculty, providing training sessions to the faculty regarding various educational technologies, and providing relevant technologies.

The above discussion indicates that there was an expansion in the faculty's job during Covid-19 in the form of revisions in course content, assessment strategies, assessment instruments and administrations, and delivery frameworks. To deliver the sessions remotely, the faculty had to adopt relevant educational technologies, which implied exerting additional physical and/or psychological efforts. Schaufeli et al. [2] considered this as 'job demands' that required additional resources for the faculty to not experience stress and burnout. Here, it becomes important to understand the job demand-resource model in the context of higher education provision during Covid-19.

The job demands-resources model assumes that every job is associated with factors that can be categorized as job demands and job resources [2]. Job demands are those physical, social, organizational, and psychological aspects that require cognitive and emotional efforts or skills, which incur psychological costs or physiological costs. The job resources are vital to performing the job, achieving the goals, reducing costs, developing employees, and preventing stress and burnout among employees. There is extensive literature available on the job demand-resources model because of its application to any kind of occupation. During Covid-19, the nature of the faculty's job changed and created new requirements for resources to perform the job. These changes and their influence on the provision of higher education is discussed in the next section.

3. Disparity in higher education caused by the faculty's job demands and resources

During the Covid-19 pandemic, the definition of the faculty's jobs witnessed some addendums. The sudden switch from face-to-face course delivery to remote teaching expanded the nature of work [3]. These expansions came in the form of revising the content, making it compatible for remote learning, condensing it to small chunks for effective learning, and reengineering the delivery framework. All these changes were implemented to facilitate remote learning within the parameters of existing resources [4]. It was beyond HEIs' capabilities to suddenly procure or develop resources needed by the faculty to execute their newly defined jobs. Furthermore, the faculty had to quickly resort to remote teaching and they did not have sufficient time to craft the necessary skills to develop content and activities, adding to their stress and resulting in burnout.

Furthermore, Covid-19 required amendments in learning environments and faculty members needed to rethink their teaching strategies to engage students and motivate them for remote learning [5]. Baran et al. [6] suggested the faculty to be more empathetic toward students and to be creative in developing remote learning environments. Hodges et al. [7] noted that the faculty undertook the role of facilitator to support students to accept remote learning.

The faculty also had to revamp the summative and formative assessments while lockdowns were in place. The faculty members revised the assessment strategies and designed the assessments compatible with remote learning [8]. Additionally, faculty members had to turn their homes into classrooms and incur personal expenses to procure devices, furniture, and supplies. Besides these financial expenses, the faculty was under stress and isolation due to Covid-19 lockdowns. They were physically and socially separated from their peers adding to psychological and social demands. Concurrently, the social aspects of the faculty's job were suddenly transitioned to an online or remote environment. Furthermore, in some developing and underdeveloped nations, the faculty members could not fulfill their job demands because of power disconnections, weaker internet connections, and a lack of technological skills [9, 10]. Due to lockdowns, the faculty had limited to no access to campuses and other stores to buy physical goods needed to deliver the class. And to transition from face-to-face teaching to remote teaching, faculty had to invest extra time and cognitive efforts. They also experienced work-life imbalance. The increased number of Covid-19 cases among faculty's social connections added to their psychological stress and anxiety.

In short, faculty's job demands increased tremendously and they had to invest more physical, mental, and psychological efforts to meet the expanded job demands. According to Schaufeli et al. [11], such job demands should be supported through the availability of adequate resources. Mercali et al. [12] highlighted that the faculty's job demands include workload, change management, emotional demand and work-life balance demands. These demands need to be supported through work resources, organizational resources, professional development resources, and social resources. For the faculty's job, these resources include teaching tools, adequate time, academic freedom, trust, interpersonal relations, professional development, open communication, fairness, and participation in the decision-making process [12]. As per the job demand-resources model, the faculty experienced high levels of stress and burnout. The most pressing job demand for faculty was to develop and deliver remote teaching, and to fulfill this demand, the availability of two resources became necessary—educational technologies and developing competencies to use these technologies.

A plethora of studies [10, 13, 14] conducted during Covid-19 in the context of higher education suggests that HEIs fast-tracked the professional development of their faculty members' technological capabilities. Arora et al. [15] concluded in their study that besides network issues and limited access to devices, the faculty lacked the training to teach online. Pandya et al. [1] found a significant increase in faculty members' professional development sessions during Covid-19. Brooks et al. [16] surveyed the faculty's readiness to create or convert content compatible with online delivery and found that faculty were unprepared. To face Covid-19 challenges, Schildcamp et al. [17] recommended HEIs to focus their professional development sessions on educational technologies and technological knowledge. However, HEIs in lower-income countries lacked resources to provide suitable educational technologies, training, and support. According to O'Hagan et al. [18], about 50% of faculty received basic training, which did not include technological competencies. Moreover, many faculty members did not even have access to computers and the internet to receive basic training [19]. In Nigeria, even experts in information and communication technologies were not trained to facilitate remote learning [20]. Tosun et al. [21] mentioned that in Turkey, faculty provided online classes that were ineffective because they were not trained for such deliveries. Faculties with a lack of adequate training in educational technologies used for teaching remotely could not even support students during classes. In the Middle East and North African region, about 18% of countries provided training to faculty

[22]. Moreover, many countries with poor digital infrastructures experienced under-development of faculty to cope with emergency remote learning transitions. In many low-income countries, faculty members did not have access to laptops, broadband subscriptions, and technological know-how [23]. For faculty in these countries, there was an enhancement in job demands but resources remained limited.

Apparently, during Covid-19, this was the case in most HEIs. However, the resources available to faculty members varied across different HEIs types (private versus public) as well as across different nations (digitally developed nations versus digitally underde-veloped nations). The lockdowns enforced remote teaching or online teaching, and the HEIs with strong technological infrastructure could mitigate the risks of discontinu-ing their teaching and learning activities. However, the HEIs with poor technological capabilities experienced several challenges to continue imparting education. For clarity purpose, here, the technological capabilities comprised of educational technologies available within the HEI and the capabilities of the faculty to use these technologies. The next section discusses how the technological capabilities of HEIs caused disparity in higher education during the Covid-19 pandemic.

4. Disparity in higher education caused by technological capabilities

Educational-technologies capabilities facilitate the adoption of the best teaching and learning approach in achieving learning objectives in technology-driven learning environments [24]. During Covid-19, the learning approach shifted to remote learning, and educational technologies became the medium to impart education. Hodges et al. [7] highlighted that the challenges posed by Covid-19 were well managed by the HEIs with developed capabilities to deliver online or remote teaching. The faculty working in these HEIs already had the resources required to deliver remote sessions. Furthermore, HEIs already in the business of providing online education had minimal impact on providing education during Covid-19. They already had well-developed technological infrastructure and the faculty were competent to deliver remote education.

Zarei et al. [23] noted that developed countries transitioned rapidly to emergency remote learning because they already had technological infrastructures. This was not the case with developing countries as they lacked the technological capabilities to impart remote higher education. This created disparity in higher education provi-sion between developed nations and developing nations. In developing countries, students and faculty faced major challenges because of the non-availability of devices such as laptops/smartphones and internet connections [25]. Bhuasiri, Abdel-Gawad, and Alqahtani [26–28] noted that the faculty in developing countries did not possess enough technological capabilities to develop and deliver virtual content. Furthermore, many HEIs lacked virtual learning management systems to commu-nicate and teach remotely [29]. Some HEIs in developing nations resorted to social media sites to establish communication between the faculty and students, and to create an online community of faculty and students.

Even within a particular country, developed or developing, researchers like [30] found the disparity in higher education among students from different income groups. The students from low-income groups were deprived of higher education as they could not afford learning devices and broadband subscriptions. For instance, in California, USA, only 56% of students from lower-income households had a broad-band connection. Some students used their smartphones, and due to not being able to afford data packages, they experienced dropping from the ongoing session. Zhang

and Tadesse [19, 31] emphasized that for successful remote teaching, accessibility to learning devices and the internet is essential.

Hence, instead of focusing on developed and developing economies, it is advisable to consider whether the technological capability of a particular nation is developed or underdeveloped. Li et al. [32] reported this through the digital divide found in different countries. OCED [33] defined digital divide as "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities" (p. 4). A similar definition is provided by Soomro et al. [34] wherein the digital divide is "the gap between people who have adequate access to ICT and those who have 'zero' or poor access to ICT" (p. 1). Tosun et al. [21] reported that in Turkey, the faculty and students did not have access to devices and the internet. Similar reports were shared for students from Palestine [35] where students reported non-availability of technological infrastructure. Sun et al. [36] discussed that 90% of countries with high income delivered online education during Covid-19, while about 66% of countries with low income provided either online education and/or broadcast education. This created disparity in providing higher education across the world. For instance, around 28% of African countries provided higher education through radio and television and 22% through blending online and broadcasting, while countries from Europe, East Asia, Latin America and the Pacific provided remote learning through online platforms or combined it with broadcasting channels for rural students.

Irrespective of the efforts from the digitally underdeveloped nations and their HEIs to deliver remote learning, students did not receive the classes. Some of the reasons mentioned by Winthrop et al. [37] included students not having computers or television or radios or smartphones. The large family size complicated the issue, as the learning environment was either noisy or devices were shared among the siblings. In India, though 70% of students joined online classes, most of them used their smartphones [23]. Adedoyin et al. [3] postulated that smartphones are not ideal for online learning, as the content and activities are not compatible with smartphones. On the other spectrum is the easy accessibility of devices among students from the United States. Galanek et al. [38] highlighted that in the United States, 95% of students had access to a smartphone and around 91% of students owned a laptop. Furthermore, students from high-income households own more than one device. This created a new digital divide segregating students based on income groups. Students from high-income households own multiple devices and have easy access to broadband services while students from lower-income households struggle with old devices and no broadband subscriptions at home. McKenzie et al. [39] pointed that there exists a new digital divide in the United States, wherein students from lower-income households own a device, but these devices miss keys, or the batteries cannot hold power, or the data packages are limited. Moreover, the limited access to broadband subscriptions, low network coverage, and costly data access created a new digital divide among various nations in providing higher education. According to the data published by UNCTAD in April 2021, 36 countries are classified as least developed countries for having low network coverage and expensive data access. Most of these countries are from the African continent and Indian sub-continent (Bangladesh, Bhutan, Nepal, Afghanistan). The Digital competitiveness ranking by the IMD world-ranked top ten countries—the United States, Singapore, Denmark, Sweden, Hong Kong, Switzerland, Netherlands, Korea Repl., Norway, and Finland. Notably, the digital divide defined the technological capabilities of a nation that further influence the technological capabilities of an HEI within that nation.

5. Discussion

In light of the literature discussed above, the disparity in the provision of higher education during Covid-19 is evident across several nations. The nations with advanced technological infrastructures housed the HEIs, which continued to provide education during the Covid-19 pandemic with minimal disruption. One can interpret that the technologically advanced countries supported HEIs by providing them infrastructure that is much needed for conducting remote teaching during emergency lockdowns. The broadband networks, easy accessibility to the learning devices, and advanced communication technologies facilitated an easy transition from face-to-face teaching and learning to remote sessions. The landscape of providing higher education in underdeveloped nations during Covid-19 witnessed broadcasted sessions and, in many cases, a temporary halt in teaching and learning. In a bigger context, we can assess that at the national level, despite having national resources, technologically underdeveloped countries could not support HEIs and in turn, the faculty and students were not supported with basic resources needed for emergency-remote teaching and learning. OCED [33] reported that the digital divide was already existing before Covid-19, but this study established that this digital divide further created an education divide, the effect of which will be witnessed in a few years. This is because human capital development continued in technologically advanced nations, while it diminished in the underdeveloped nations.

Another focal area that emerged in this chapter is the drastic expansion in the faculty's job demands and the influence of resources on the disparity in higher education provision during the pandemic. The nations with advanced technological infrastructure hosted HEIs that further offered resources to the faculty to build their technological capabilities. The faculty in these nations were facilitated with access to devices and broadband connections, intense professional development sessions and readiness to remote-teaching transition, and availability of educational technologies as well as technical support. This was not the case in underdeveloped nations. The HEIs and the faculty were far from being ready to face the challenges posed by the Covid-19, to continue providing higher education. The value of making adequate resources available to the faculty for performing their job with reduced stress levels and burnout appeared on the surface during Covid-19; this was not discussed in depth before the pandemic. This further will probe the policy developers, curricula designers, and academic managers to identify and balance the job demands and resources equilibrium for the faculty's role.

A noteworthy point in the literature, beyond the digital divide, was the concept of the 'new digital divide,' which is experienced by students in technologically advanced countries. In this context, the concern for resources moved from possessing devices and the internet to owning multiple learning devices and the accessibility to broadband connections or bigger data packages. Though Sommro et al. [34] finds this new digital divide creating a disparity in receiving higher education, viewing it in an international context will indicate the advent of wider division in the student body, ranging from students with no access to any device and internet to students owning multiple devices and faster connections to receive an education.

Such divisions, as indicated by O'Hagan, Zarei, and Castro [18, 23, 32], already existed before Covid-19 but surfaced during the pandemic. The disparity in education provision has existed for centuries; Covid-19 changed its form to providing education remotely or online through digital channels. Now, the divide is not based on economic standing but based on technological capabilities. Researchers concur that Covid-19

posed challenges to HEIs for rapid transformation to remote teaching [13, 18, 20]. It also provided opportunities to HEIs [39] to develop their technological capabilities, that otherwise would have taken over a decade.

6. Conclusion and recommendation

The disparity in providing higher education during Covid-19 is evident from the discussion recorded in this chapter. The global pandemic instigated governments and HEIs to resort to emergency remote teaching and learning. Like peeling the layers of an onion, we uncovered that the world as such is divided into two categories—countries with advanced technological capabilities and countries with underdeveloped technological capabilities. The countries with advanced capabilities supported their HEIs, faculty, and students. The faculty, in these countries, were in a better position to receive needed resources to fulfill their job demands and were able to continue providing higher education. On the other hand, the countries with poor technological capabilities were unable to facilitate remote teaching. This created a disparity in higher education provision among different nations. One can anticipate the impact it will make on the future national workforce. The advanced nations will continue to have qualified graduates produced by their HEIs, while underdeveloped nations will not be in a position to develop quality graduates. This will further influence the quality of new entrants in the workforce.

It is crucial for nations to build their technological capabilities and for HEIs to redefine the faculty's job description and allocate the resources necessary to carry out their duties. It is recommended to the policy developers to develop contingency plans for such pandemics and develop policies, processes, and systems to avoid discontinuation of higher education. The governments are suggested to provide free internet wireless access for students and teachers located at community places like open parking spaces or city halls, especially in areas populated with low-income households [38]. The lack of access to a device can be overcome by lending laptops on a short-term basis to public libraries or institutional libraries. The leaders of HEIs are suggested to provide academic freedom to the faculty to develop and deliver content compatible with remote learning and to choose from the available technologies. This will reduce the psychological stress and encourage the faculty to devise the course to achieve learning outcomes [10]. Lastly, HEIs can embrace an integrative approach with students, faculty, educational technology support department, and curriculum exerts as constituents engaging in a dialog process to overcome the challenges.

Conflict of interest

There is no conflict of interest to declare. There is no financial interest to report.

Author details

Bharti Pandya[1*], BooYun Cho[2] and Louise Patterson[3]

1 Higher Colleges of Technology, Dubai, United Arab Emirates

2 Jeju National University, Jeju, South Korea

3 American University of Ras Al Khaimah, Ras Al Khaimah, United Arab Emirates

*Address all correspondence to: bpandya@hct.ac.ae

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Towards the Development of the Decolonized Pedagogy for Higher Education in South Africa: A Students' Perspective

Mamsi Ethel Khuzwayo

Abstract

This chapter presents views, opinions, and perceptions about the curriculum theories that propagate educational perspectives of social injustice, cultural exclusion, supremacy, socio-economic inequality, and inequity. The data collection method was question and answer and deductive reasoning conducted in small groups in education studies classes. Pieces of information recorded in video clips during the COVID-19 lockdown were analysed through qualitative procedures, transcribing verbal data, and sorting coded categories of data. First, the frequencies of statements indicating trends in thoughts form themes classified as convergent and divergent perspectives. The interpretation of themes identified during data analysis seeks to address the problem statement in this chapter, which is the paradigm shift for a conceptualised decolonised curriculum in South Africa. Thus, the research question asked in the study is "what principles should underpin pedagogical content knowledge (PCK) of pre-service teacher education and training?" The source of data was interviews and document analysis. The synthesis of the results drawn from the raw data was based on the theoretical and conceptual framework established from the works of scholarship researchers on decolonised education. The interpretation of the findings addressing the problem statement and the research question was presented through convergent and divergent perspectives that characterise the beliefs and thoughts of students about curriculums for decolonised education in South Africa. The study highlights uncertainties about the concepts, divergent conceptual stances on decolonised education, and the lack of uniformity in the perceptions of philosophical principles or foundations of perspectives on decolonised education.

Keywords: conceptualising, pedagogy, decolonised, curriculum, content, higher education

1. Introduction

The implementation of this study's agenda is grounded in the alienation of education as a social activity. The researchers view education as a socio-cultural activity that should promote society's value systems, cultural beliefs, and social goals rather than imposing

the supreme culture's cultural values and beliefs alongside hegemonic attitudes. The no recognition of other cultures and historical backgrounds as insignificant and subordinate creates social instability in society. Karl Marx, an advocate of the social theory, asserts that inequality, discrimination, and oppression are the root causes of social strife and resistance in society. The "Fees Must Fall" campaign, which was the voice of the disgruntled and frustrated generation of students, in all its manifestations, indicated resistance to the philosophical beliefs that underpin the design and development of curricula in universities. In students' perceptions, the curricula display no recognition of other cultural backgrounds, portrays knowledge systems of the subordinate class and cultural groups as insignificant, and promotes the supremacy of a Eurocentric worldview at the expense of indigenous and minority groups. The terms decolonisation and decolonised education were at the core of the campaign, and for researchers this worldwide term became a cause for concern. The arguments and findings presented in this work are part of the emerging scholarship of decolonised education. Research highlights that the terms 'decolonisation' and 'decolonised education' have been interrogated from various dimensions; socio-cultural, socio-economic, and political perspectives have already been established. However, the perspective presented in this piece of work is based on a viewpoint centred around school curricula. This perspective is based on the belief that a curriculum, even in a policy, blueprint, or activity, is an agenda for social construction grounded on foundations of philosophy (world outlook). The theoretical principles underpinning the curriculum theory and its practices are generated from the world views of those in power [1, 2]. This research aims to discover decolonisation and decolonised education's philosophical principles, informing pre-service teachers' curriculum development and training.

Some educational researchers and theorists have developed a critical perspective to challenge the entrenchment of social injustices within educational theories and practices. The pioneers of this scholarship [1, 3–6] focus their criticism on the philosophical foundations of pedagogical approaches, which promote indoctrination and the maintenance of the socio-economic order [6] point to hegemony and exclusion as a philosophical agenda to demean other cultural and historical backgrounds and world outlooks.

2. Literature review

The conceptual knowledge of decolonisation and decolonised education in this study draws ideas from the premise of scholarship and research, which advocate discourse for the traditional philosophical foundation of education, and these ideas are pioneered in the works of many researchers [1, 2, 6, 7]. This study discovered that the discourse regarding the philosophical foundation of education contests the perennial view of knowledge and its disposition to enforce the reproduction of knowledge. Muller and Young [5] and Muller [6] argue that the reproduction of knowledge elevates a world outlook at the expense of other co-existing counterparts. Hence, knowledge for power and powerful knowledge overwhelm the pursuit of inclusive acknowledgment and the recognition of socio-cultural and historical perspectives in knowledge production. Furthermore, this chapter extends the view that philosophical ideas underpinning education and curricula in South Africa perpetuate conformity to the educational principles and the goals of the elitist supremacists and chauvinists who hold colonial and imperial world outlooks. Hence, the "Fees Must Fall campaign" instigators linked colonialism to educational principles and goals that dominate knowledge structures and knowledge production in South Africa. The realisation of the exclusion and the disregard of other

world outlooks in the knowledge structures and in knowledge production was the core of the movement's contention during the campaign.

According to psychological studies, the issues of identity, equity, social justice, and respect are embedded in recognising people's cultures and their contributions to advancing society's socio-economic environment and political systems. The argument about fundamental principles is that decolonising education and curricula cannot become reality without a carefully researched and conceptualised paradigm to frame pedagogy. Semetsky [7] argues that educational research should first challenge the absolutist view embedded in the hegemonic view of pedagogy. The view of pedagogical content knowledge that promotes the authority of teachers over knowledge and learning strategies deprives learners of the freedom to engage critically with diverse realities and perspectives.

Furthermore, Semetsky ([7], p. 13) contends that the ideas of Plato, Descartes, Kant, and Heidegger, which form part of content knowledge in educational studies, entrench traditional beliefs about teaching, learning, and content.

> *"The history of philosophy has always been the agent of power in philosophy, and even in thought. It has played the repressor role. As a result, an image of thought called philosophy has been formed historically, and it effectively stops people from thinking."*

The first perspective of decolonisation regards a paradigm shift for promoting social justice, social and cultural identities, and a redress of Eurocentric supremacy and imperial attitudes. This perspective advances the ideas of many researchers [5, 8–12] about decolonising education. Convergent views of scholars challenge the promotion of a narrow view of the perspectives of knowledge and the philosophical foundations of pedagogy to encourage a one-dimensional approach to the interpretation of reality and the interrelationships of world systems. For example, Bignall [11] contends that colonialism; cultural supremacy, and imperialism are intertwined, colonialism being the political attitude to subdue indigenous people under the supreme political power through conquest and cultural supremacy being the mechanism to maintain the socio-economic structure. Imperialism is an economic tool to finance the system that has been established. According to Bignall [11], cultural supremacy and imperialism were about oppressive attitudes and practices towards the indigenous people. However, imperialism and colonial pedagogy create perceptions of inequality, competition in class divisions, and the stratification of people of the same cultural group through education. Similarly, Semetsky [7] and Popkewitz [13] construe colonialism and education when stating:

> *"Formidable schools of intimidation which manufactures specialists in thought-but which also makes those who stay outside conform to all the more to specialism which they despise."* ([1], p. 26).

Muller [5] extends the narrative of conformity and the hegemony-oriented pedagogy when pointing out that knowledge production and knowledge structures promote the narrow world views of elite and supremacist groups in theory and practice. The narrow world view promoted by colonialist and imperialist pedagogy enforces exclusion and disregards indigenous peoples' cultural achievements and the experiences of subordinate cultures in what is considered knowledge for the powerful Muller [6]. Popkewitz [13] confirms that excluding indigenous cultures and their

socio-economic outlooks creates a perception of insignificance, subordination, and unworthiness in individuals identified with such communities. Psychosocial theories highlight that the social identities of the subordinate cultures are the sources of socio-political and economic instability in society [14, 15].

The second perspective of decolonisation promotes the reconstruction of pre-colonial traditional, indigenous lifestyles and acknowledges different world outlooks that co-exist with the Eurocentric worldview. These ideas drew from the studies and works of many researchers [16–19] who challenge the exclusion of Afro-centric perspectives in the study of the philosophy of education in universities. The above views include the recommendation of robust debates and discussions regarding the 'Africanisation' and 'decolonisation' of the content for the philosophical foundation of the pedagogy education to address the excluded perspectives of education in South Africa. The literature reveals that researchers consider decolonisation a pressing issue in the debates and discussions about curriculum development for higher education after the student uproar in 2015. The ideas and opinions elicited from notable publications [20–27] congruently point to the perpetuation of the bias and prejudice in the epistemological principles underlying the design and development of curricula in higher education and training. Kabela [20], Savo [26, 27] argue that decolonisation implies a change in the philosophical foundation of education and its curricula, and this change entails revisiting the epistemologies, theories, and principles that promote a Eurocentric world view. As perceived by other researchers, decolonisation is a challenge to the education and curriculum design and its development which intends to promote a Eurocentric world view and cultural chauvinism vour of cultural supremacists in South Africa [24, 25, 27–29].

The third perspective of decolonisation promotes modern cultures emerging from the co-existence of indigenous and Eurocentric cultures to construct a postmodern society. The culture of the colonised and colonisers exists in harmony. The advocates of this perspective advance the view that the colonised and colonisers' co-existence over centuries has resulted in the mangling of lifestyles and cultures [8–10]. The intercultural and cross-cultural viewpoints are undisputed realities; today, no pure cultural backgrounds could be maintained in colonial communities. As Bignall [11] contests, the conceptual understanding of decolonisation is that it is the rejection of aspects of knowledge that colonial societies have accumulated through their co-existence. According to the advocates of this perspective, the reviews of curricular and educational practices must be based on philosophical grounds that are free of bias, stereotypes, ethnocentric world views, and cultural chauvinism and supremacy. The social, political, and economic injustices justified by the philosophical views that underpinned the educational systems of the imperial and colonial powers should be carefully uprooted and replaced by the alternative paradigms agreeable and accepted by all sectors of the society.

In his work, Apple [1] supports a narrative that advocates for equity, social justice, and inclusion; "what knowledge and whose knowledge?" Similarly, Slattery [4] and Pinar et al. [2] envisage knowledge production mechanisms that address cultural chauvinism, cultural supremacy, and colonialism in curriculum development at all educational levels. The argument presented in this chapter extends a narrative that promotes the agenda of social reconstruction by including world outlooks and interpretations of human existence in teaching philosophical knowledge to university students.

The three perspectives of conceptualising decolonisation form the framework for analysing the ideas and views of the students who participated in the research discussions.

The narrative of colonial education pursued in the works of Bignall [11] and Patton [9] advance the view that academics and intellectuals that have been created or produced by the colonial education system are judged by their higher levels

and standards of conformity to philosophical knowledge that do not recognise or acknowledge their socio-cultural contributions to the creation and setting of those intellectual standards. The perspective highlighted by Bignall [11] is considered in this work as significant for the following reasons. First, over centuries colonialism created new breeds of societies, which created economies, new settlements, and cultures through co-existence. Second, the reality of change and progress cannot be reversed back to a period of pre-colonialism and traditional lifestyle. In the same trend of thought, Patton ([9], p. 121) argues that colonisation is a philosophy invented by imperialists. This philosophy is inherent in the perceptions of the supreme culture, supreme value systems, and Eurocentric world outlooks.

Furthermore, Patton [9] states that colonialism produced attitudes of dependency, timidity, subordination, helplessness, emptiness and defeat, insignificance, and submissiveness in colonised communities. Semetsky [10], in the same vein, argues that research in the field of philosophy and education should focus on the creation of new concepts and further proposes the reconceptualisation of concepts invented during colonial and imperial dispensation in the context of socio-economic and political transformation. In agreeing to the pedagogy of freedom and liberation, Semetsky [8] also suggests that problem-based, inquiry-based, and experiment-based learning are the tools to use to transform the colonial philosophical foundation of education; where students should be apprentices in their field and should learn to identify particular problems and how to approach them in a way that leads to solutions. In the perspective of Deleuze, the rhizomatic theory explains how students can develop sprouts of new images of thought from what is readily available Bignall [11]. The shift from 'what is' to 'what can be' in learning is also significant in adult education [9, 30].

3. Theoretical framework

This study utilises the ideas and principles of transformative learning theory, social theory, and identity theory as they have created a framework to guide the qualitative research, data collection, data analysis, and the synthesis of the results. According to Mezirow's transformative theory Mezirow [15], individuals with different cultures, religions, languages, and races develop a frame of reference based on society's perspectives of diversity. The rationale for transformative learning stems from ethnocentrism, stereotypes, and bias in social identification and self-identities in education. According to Calleja [30], Mezirow's transformative learning theory asserts that becoming aware of one's own and others' tacit assumptions and expectations and addressing their relevance for making interpretations as these are the core attributes of adult education. Mezirow's theory describes the transformation in the process of learning in two dimensions. The first dimension is about establishing a new world view or frame of reference, which results from a Critical Reflection of Assumptions (CRA). The CRA dimension is characterised by Habits of Mind (HoM), which are persisting, managing impulsivity, listening with understanding and empathy, thinking flexibly, meta-cognition, striving for accuracy, questioning and problem posing, thinking independently, openness to continuous learning, gathering data through all lenses, creating, imagining, innovating, and thinking independently [31, 32]. These habits in Mezirow's theory are based on logical, ethical, ideological, social, economic, political, and spiritual experiences. The second dimension is the Critical Subjective Reflective Assumptions (CSRA) frame, comprising the psychological and cultural limitations. Through CSRA, individuals can be freed from cultural distortions and constraints; such freedom allows for open

discourse. According to Calleja [30] and Taylor [33], the CRA and CSRA are the frames of reference for adult learners to develop a discourse leading to perspective transformation. According to Mezirow [15], these two lifetime frames of reference make it possible for adult learners to interpret others' world views and cultural/contextual experiences. Mezirow's theory suggests that self-reflection and empirical analytic discovery transform the stereotypical and ethnocentric perspectives individuals accumulate through various means of socialisation to their adult life.

4. Research paradigm and methodology

Interpretive, critical paradigms are utilised to frame this study. For example, according to Henning et al. ([34], p. 19), phenomena and events are understood through mental processes of interpretation which are influenced by and interact with social context. In the same vein, ideas of the critical paradigm were encapsulated in the framing of this research because the case study research design and methods of data collection used were based on participation, collaboration, and engagement with the participants in their designated workplaces, as per the recommendation of Creswell and Creswell [35]. This paradigm is also recommended for studies that seek to discover trends and patterns of thought about a phenomenon that could lead to discourse in the status quo.

The problem statement for this study was the perspective or frame of reference of pre-service teachers on the conceptual understanding of decolonisation and decolonised education, from a philosophical standpoint. This problem statement is based on the assumptions highlighted in the theoretical framework of this study; Critical Reflection Assumptions (CRA) and Critical Subjective Reflective Assumptions. The question emanated from this statement was, "does the teaching of philosophical knowledge influence pre-service teachers to conceptualise curricula for a decolonised education system?" The purpose of the study was to explore views, opinions, and ideas of pre-service teachers that could influence the development of an alternative paradigm for empowering teachers with the competence to promote a balanced worldview in teaching and learning in schools.

5. Research design and data collection procedures

Students in the final year of their undergraduate program, Bachelor of Education (B. Ed), were targeted for this study. 340 students in the educational studies course were asked to form groups of 12 individuals, and that numbering resulted in 34 small groups. Collaboration, engagement, and participation were encouraged and monitored during the process to ensure that all students received the opportunity to express their views. Ethical protocols were adhered to, as suggested by McMillan and Schumacher [36], in that participants should not be coerced, they have to be informed about the purpose of the research, confidentiality should be guaranteed, and anonymity is assured. These ethical issues were addressed before the project started.

6. Data collection procedures

The group discussion was organised with finalist students engaged in presenting their views and opinions about decolonised curriculum and pedagogy that students

aspired to in the 2018 'Fees Must Fall' protest. Students in the class of 100 participated in group discussions, and students formed their groups of 10 members. The groups were asked to create 20 min video clips and send them to the researcher. The videos were the sources of data that were analysed for the findings presented and discussed in this work. The groups were formed based on their interests and their common choices regarding philosophy and curricula paradigms.

The researcher provided the following question to guide students' discussions

- Views, ideas, and opinions from studying the philosophical foundations of education and curriculum can be the best for the decolonised curriculum.

- Teaching and learning methods appropriate for promoting all cultures (knowledge) in the former colonies.

- Views about methods used in universities to promote a balanced view of cultures.

- Reflect critically on ideas, opinions, and views the group presents to make recommendations.

The divergent arguments raised by students manifested in frames of reference concerning the philosophical foundation and the paradigms of curriculum theory for current academic curricula.

7. Data analysis process

The process of data analysis followed the qualitative methods and guidelines of the interpretivist and critical paradigms. The views of the students were coded based on their perspectives of decolonised curriculum and pedagogy; this includes (i) their ideas and views that advance a decolonised curriculum and pedagogy, and (ii) their Critical Reflective Assumptions on the limitations in the current university curriculum in the context of suitability for the decolonised education system. The statements were given labels or codes as a means of sorting data. For example, radical critical reflections, moderate critical reflections, and neutral critical reflections. Thereafter, the coded statements were classified under categories manifested in the coding process.

The next step was to sort the categories of data according to Convergent Views (CV) and Divergent Views (DV). The sorting was based on the frequency of statements highlighting related and similar perceptions of decolonised curriculum and pedagogy, teaching, and learning methods to advance decolonisation. The trends in the patterns of thought were identified and presented as themes.

8. Results

This section presents a summary of the data which was classified into categories. **Tables 1** and **2** present the descriptive statistics that summarise the data gathered on the biographical information provided by participants about their cultural backgrounds, race, and socio-economic backgrounds; **Table 3** presents the classified codes; and **Table 4** presents summary of data indicating the frequency of codes from the sample of thirty-four groupings of participants.

Cultural background	Number of participants
Muslims	120
Christians	150
Others	30

Table 1.
Demographics of participants in terms of cultural background, racial grouping, and socio-economic status.

Racial groupings and socio-economic status	Number of participants
Africans	167
Coloureds	107
Whites	26

Table 2.
Summary of biographical data showing the demographics in the grouping of participants.

Codes	Radical critical reflections (RCR)	Moderate critical reflections (MCR)	Neutral critical reflections (NCR)
	Views and opinions that promote the restoration and replacement of Eurocentric perspectives of philosophical foundation and related pedagogical approaches	Views and opinions advocating philosophical foundations that acknowledge and recognise diversity in unity	Views, ideas, and opinions that do not support Eurocentric perspectives on Education or Afrocentric ones.

Table 3.
Classified codes.

Frequency of Opinions and Ideas (=34) Coded and Classified data	Coded data		
	RCR	MCR	NCR
Question 1: philosophical foundations that support the total removal of Eurocentric and colonial perspectives and replace them with Afrocentric perspectives	26 (=34) groups	5 (=34) groups	3 (=34) groups
Question 2: teaching and learning methods appropriate for promoting all cultures (knowledge) in the former colonies	18 (=34) groups	12 (=34) groups	4 (=34) groups
Question 3: methods used in universities to promote a balanced view of cultures	16 (=34) groups	14 (=34) groups	4 (=34) groups

Table 4.
Summary of data indicating the frequency of codes from the sample of thirty-four groupings of participants.

9. Findings

The data reveals convergence and divergence in the trends of the thought expressed in the statements concerning the decolonisation of the curriculum in higher education. The following points of view were discovered from the categories of data

presented in **Table 2**. According to transformative learning theory, reflections are the product of systematic and logical thinking about ideological, political, and social systems in society Mezirow [15]. This principle of transformative theory was confirmed in the evaluation and examination of the injustices of the colonial system of education and the suggestions expressed by participants regarding solutions and changes in the curriculum and its philosophical foundations. However, critical reflection depicts three diverse perspectives, one being the radical critical reflection on the philosophical foundations for the decolonised curriculum and pedagogy. While the other two perspectives considered moderate and neutral solutions in addressing the supremacy of colonial perspectives of philosophical foundations of curriculum and pedagogy.

9.1 The Radical critical reflection perspective decolonises the philosophical foundation of education and pedagogy

This perspective proposes the idea of *Ubuntu* and other Afro-centric philosophies for the decolonised curriculum. The statements advocating a complete paradigm shift from the Eurocentric perspective conceptualise decolonisation in the light of the restoration of the indigenous African value systems and traditional cultural practices. In this perspective, a curriculum should be about reviving indigenous knowledge systems. A frequency of 26 statements was identified with opinions and views that pointed to the significance of the *Ubuntu* philosophy. The perception of Ubuntu or humanity in this perspective means the promotion of respect for all human beings regardless of socio-economic, racial, and cultural status. The views and proposed discourses of the participants, such as replacing Greek, Roman and other European Philosophies of curriculum for higher education, indicate the strong thirst for freedom of choice and liberation of the mind. The descriptive statistics in **Table 2** indicate a strong trend of thought in 26 groups (76%) that advocated for views of a complete shift from the colonial perspective of philosophical foundations and curriculum design in favour of the decolonised curriculum in Higher education. For example, participants commented that:

> *"Ubuntu ideas link people to the values and importance of equality and equity. Unlike colonialism, Ubuntu does not promote the supremacy of race and cultures."*

> *"Ubuntu philosophical ideas allow people to be proud of their cultural heritage and respect that."*

> *"We cannot be free when our education still oppresses us. The African philosophy of Ubuntu shares the same ideas that we learned about from socialist-realism philosophy."*

Reflections about pedagogy highlighted that strategies of teaching and learning are oppressive and constrain freedom of thought and reasoning. The participants expressed discontent about the exclusion of students' perspectives in curriculum designs and development. Participants comments alluded that:

> *"Some lecturers do not accept our thoughts. Knowledge is rigid, and we are taught about this of the hidden history in Science, Mathematics, and the Shakespeare of this world."*

> *"Students are not considered in the selection of themes and methods. Critical paradigms encourage debates, dialogues, and discussions, and these are the methods we enjoy the most than listening to one person telling us."*

9.2 The moderate perspective of philosophical foundations for a decolonised curriculum and pedagogy

The views classified under the Moderate Critical Reflections (MCR) highlighted a trend of thought that acknowledges the intercultural influences in the historical colonial society. The views expressed the significance of the recognition of all cultures and heritages of the people in the society. This perspective strives for a multicultural philosophical foundation for the curriculum and pedagogy as the participants insisted addresses issues of mutual respect between all cultures, heritages, and knowledge systems. According to the descriptive statistics, five groups (=34), accounting for 14.7% of participants, expressed views, thoughts and opinions that support a multicultural philosophical foundation to underpin the decolonised curriculum. The participants commented that:

> *"In our view as South African, we need to show mutual respect of all cultures, heritage and our indigenous knowledge, and religious beliefs."*

> *"Schools and universities should acknowledge the values of diverse heritages and cultural backgrounds. Colonialism developed this kind of attitude of exclusion, discrimination, and high class and lower class."*

> *"For example, South Africa is a multicultural society, but we are still learning about discoveries and inventions of other countries and cultures as if South Africans are ignorant. We chose Social constructivism ideas and critical paradigm because these ideas can encourage us all to admire and appreciate our knowledge and diverse cultural backgrounds."*

Statements concerning pedagogical issues identified with this perspective pointed to the danger of political interference in curriculum development and design and the participants alluded that:

> *"Education and curriculum should not be decided by the politicians and people of the elite class only. The education that is imposed from the top does not serve the needs of the poor and lower class."*

> *"Critical paradigm and social constructivism ideas promote critical thinking about real-life problems than textbook knowledge, which we do not even have interest in. We do not feel part of what we learn; we memorize facts for the sake of test and exam."*

> *"The curriculum should equip citizens with technical knowledge and skills to solve the issue of unemployment and poverty. Citizens can learn to be independent and work hard for their livelihood that seeking jobs."*

9.3 The neutral critical reflections perspective

The statistics in **Table 2** indicate a minority representation for the neutral perspective, which is three groups (=34) or 8.8%. However, in this work, this finding is critical because this number represents the views and perceptions that prevail in the colonial society. The neutral trend of thought exhibited in statements that fit neither radical nor moderate perspectives. The views that do not consider decolonisation as an important item in the agenda for transformation in the historical colonial society of South Africa. The participants stated that:

> *"Knowledge cannot be anything, but it should be from knowledgeable people because they conduct research and scientific processes to generate knowledge. Just imagine schools without books, what will teachers teach."*

> *"In democratic countries, they open schools to everyone, like here we are all competing for better results, but there is no question of who you are and from where you come. The main thing is that we should all learn from experts for us to become experts or intellectuals learn from other intellectuals."*

> *"We do not support the social re-constructionist ideas and critical paradigm because they promote freedom in the classroom, and individuals' learners' interests to us that means chaos, lack discipline, and lack of intellectual development. How can learners construct knowledge, and from where do they get intellectual expertise to produce ideas?"*

> *"The purpose of education and educating is to make citizens better. For people in society to know, they need to learn from those who are experts and intellectuals. Idealist philosophical ideas encourage people to think and to produce ideas."*

> *"Realist philosophical ideas are the best because they encourage creative thinking; citizens must think creatively to improve their economy and living standards. Realist philosophical ideas in our thinking can promote equal citizens."*

10. Discussion

This section presents a synthesis of the findings regarding the ideas, opinions, and views of the theorists presented in the theoretical and conceptual framework of this research. According to Mezirow [15] the principles of the transformative learning theory assert that adult learners can develop frames of reference from political, social, and economic experiences through various lenses. Thus, they create critical subjective assumptions about change and transformation. In the context of this study, the findings highlighted the trends of thought concerning the fundamental framework to conceptualise the philosophical foundations that ought to underpin a decolonised curriculum and pedagogy for higher education and training. The participants' perspectives identified in this research are based on the frames of reference of colonial socio-political ideological experiences. The three perspectives of the decolonised curriculum and pedagogy were the products of critical reflective thinking and assumptions about a discourse on the colonial curriculum. These are first, the restoration of the indigenous African philosophical foundation called *Ubuntu*; second, the multicultural philosophy to promote unity in diversity in the curriculum; and third, the neutral perspective that resists any interference with the status quo.

Furthermore, the findings allude to the significance of pedagogy that empowers students with knowledge, skills, values, and attitudes. The identified views and opinions were organised into themes in this discussion.

10.1 Theme 1: patterns of thought in support skills-based pedagogy

The trends of thought which conceptualised decolonisation as the restoration of the indigenous people's image and dignity criticised teaching practices that view learners as recipients of structured and formal knowledge. The argument about formal and

structured knowledge was perceived as a tool to prepare a certain kind of people who should think in a certain way. The learner and the outcomes for the structured knowledge are analysed and presented by the designers of knowledge. In the context of pedagogical content knowledge for educating and training teachers, the theories of Pavlov, Thorndike, and Skinner were cited by participants to support this argument about learning as a conditioning of the learners' behaviours and thinking patterns. The colonial and imperialist educationists and curriculum designers drew on principles of knowledge and pedagogy from these theories so that teachers could develop convictions that teaching and learning are tools to develop a particular type of people who should adopt and adapt to prescribed behavioural patterns. The antithesis of this perspective is that research in anthropology and archaeology attests that humankind, regardless of creed and origins, can develop and create meaningful and relevant knowledge to their existence in an environment.

Furthermore, studies on people's heritage and cultural backgrounds also prove humankind adheres and identifies with what they have created and developed; hence protecting and preserving the heritage and cultural achievements are significant. The statements further highlight that skills-based pedagogy is ideal for addressing one-sided or biased narratives about the cultural achievements of people in a former colonial society. The following reasons were provided to substantiate the importance of skills-based pedagogy to a decolonised curriculum:

- Skills such as analytical thinking encourage individuals to use their brain's capabilities to arrive at their truth without influence. Through analytic skills, learners in higher education can produce meaningful and relevant solutions to their society's socio-economic problems instead of structuring knowledge that they do not identify as relevant to the social, economic, and political realities in their country. The teaching and learning strategies proposed in this perspective are inquiry-based learning, problem-based learning, and collaborative learning.

- The skill of empathy is significant to address prejudice and a one-sided narrative about the colonisers and the colonised. Empathy through deductive reasoning, in this perspective, can use terminologies, concepts, and facts established by researchers that present a skewed world outlook or exclude other sides of the story; for example, history of scientific studies, political development, agricultural practices, and trade and technology. The views expressed in the statements were that the knowledge structures for these courses in these fields exclude the achievements of the indigenous people, such as developments in farming, crop production, organic food production, knowledge of plant science and technology, and craftwork. In the entire world, people are known for their expertise and contributions in these fields. "The cultural chauvinism of the imperial and colonial mindset which was in pursuit of claiming contributions and achievement of indigenous people through conquest Bignall ([11], p. 49). The promotion of empathy through deductive and logic could turn a curriculum from being a top-down product to instead being a tool to develop great thinkers, problem solvers, and inventors. Moreover, this perspective promotes equality, equity, and mutual respect in society.

- Communication skills and comprehension skills were highlighted in the statements to advance the views about the importance of language in the decolonised curriculum. The concern about the dominance of European languages in Africa, such as French and English in northern, central, and southern countries, promotes hegemony and supremacy. Languages as the pride and essential resource

for preserving culture and heritage should be prioritised in a decolonised curriculum. Promoting all languages is possible by allowing students to express opinions, ideas, and views in their language and through artefacts. Artefacts are languages in that in the designs and shapes and drawings hold meaning; people express their ideas, feelings, views, and interpretations of the universe, relationships in the physical world's systems, and world outlook through these artefacts.

The skills-based pedagogy established from the analysis of the decolonised curriculum in this discussion resonates with Deleuze's rhizomatic theory and its principles of identifying areas of interest from socio-economic and cultural environments and developing new concepts Patton [9]. The rhizome, in this literal sense, means a succulent rod, for example, sugar cane. The sugar cane rod has segments from which the sprouts of a new rod grow. In the context of the interpretation of the ideas and views provided by the study, the sprout could be new terminologies, concepts, principles, and innovations emerging from analytic skills, when students apply deductive reasoning and logic to discover the truth from different perspectives of reality.

Mezirow's theory of assumption advocates that adult learner can develop assumptions about discoveries; in this work, this implies that students in universities should apply analytic skills and skills of empathy to verify knowledge systems in the fields of choice. If this could be a paradigm for teaching, learning, and assessment, the principles of Schulman's theory about pedagogical content knowledge have to change. For instance, the lecture halls are venues of knowledge production rather than a place for students to listen to lecturers imparting themes and topics from the prescribed books and students memorising factual knowledge for tests and exams. The decolonised curriculum and pedagogy perspective promote a view of content that is selected and sequenced by lecturers and students in the classroom to allow diverse views and philosophical beliefs from different students' perspectives. The issue of the language used for communicating ideas is understood to be the tool used by colonisers and colonialists to enforce supremacy through education, which contributed to the subordination of other languages and their complete exclusion. In South Africa, for example, people of African descent have learned through foreign languages, and the disadvantages of this practice have influenced methods and learning styles and the programming of subject content. This research highlighted that learning a foreign language is the main contributor to the high failure rates in schools and universities. The mastery of English in South African universities is the criteria used to select suitable students in the qualification programs. Learning a foreign language was an area of contention in the discussion. However, the view about the seriousness of the negative impacts of enforcing learning through foreign languages to learners from indigenous communities was the most frequently observed. Imposing a foreign language is related to learning through memorisation of facts which add no value to the demands of the real-life experiences of students. Meaningless learning contributes to a high rate of learners dropping out in indigenous communities. The trend of dropping out from school, particularly among young citizens from indigenous communities, is that the education acquired does not improve communities' socio-economic situations. Education only prepares young citizens to be employees and not employers, which results in lifetime subordination.

10.2 Theme 2: decolonised curriculum and pedagogy from the liberation of the mind perspective

The statements identified from the discussion also indicate a trend of thought that viewed the colonisers' curriculum and pedagogy as a mechanism that was carefully

articulated from the philosophical beliefs of Plato, Aristotle, Kant, and Socrates which target the mind. The purpose of knowledge and learning is to create people who think and reason according to the value systems prescribed by intellectuals and inventors of knowledge. The statements condemned the ancient philosophies for preparing grounds for the oppression of the mind. This perspective argues that the colonised mind is built for timidity, subordination, dependence, and intellectual disability. An example of timidity is the mentality of submissiveness and extreme loyalty, while subordination allows individuals to be used like dogs in Pavlov's theory. The mindset of loyalty describes a situation where someone controls your thinking in terms of instructions and guidance because you cannot think, explore, or design anything. This dependence was insinuated in statements that freedom of thought and practice is witnessed in the way universities and the department of higher education structure content knowledge for their qualification programs. Students are not allowed the freedom to study courses that suit their interests and needs; as a result, the students find themselves in disadvantageous situations. Hence, the issue of unemployed graduates is becoming acceptable and makes a mockery of university qualifications. The strong view in this perspective is that universities are becoming manufacturers of intellectual disabilities. Instead of providing platforms of adventure and innovation, they create a community of young pensioners, meaning those who stay for many years depending on government grants for survival.

The following were the main qualities proposed for the decolonised curriculum for liberating the mind:

> *The curriculum should adopt ideas of a free-market ideology: universities should allow students to choose courses based on their aspirations and needs. The students should enjoy the freedom to state the knowledge and skills they require for self-reliance in terms of their job and artisan skills.*

> *Real-life situations and experiences of students should drive the curriculum.*

> *The liberation of the mind perspective advocates for a curriculum that does not force students to learn knowledge that does not make sense to the needs of their society, as the argument was that some courses should be removed because of the lack of relevance to the world of practice. The ideas articulated around worthless courses highlighted that most of the students who enrol in such courses are from indigenous communities and are the poorest of the poor. The restricted freedom in learning in universities in South Africa supports maintaining the socio-cultural status enshrined in the colonisers' imperialist views of colonialised society.*

> *The curriculum should promote equality and social cohesion.*

> *Liberation of the mind in this perspective brings in the notion of co-existence, acceptance, respect, and acknowledgment of equality. The notion of Ubuntu described in this perspective is philosophical because it should be the foundational aspiration of individuals and communities in institutions of higher learning. The example used was that ubu, the prefix, means 'being' and ntu, the suffix, means human. Therefore, being human refers to something beyond respect and the acknowledgment of co-existence. Instead, the concept defines nature and its characteristics. In the colonised curriculum, the term being human is context-based, meaning that it depends on who is referred to in terms of location, appearance, and behavioural patterns. These are the main criteria used to classify being human,*

and these criteria have created the beliefs of "us" and "them." According to the statements and arguments analysed, students in institutions of higher learning exhibit behaviours that defeat the purpose of social cohesion, equality, and equity in terms of Ubuntu. The divisions based on religious beliefs, race, and language indicate that a decolonised curriculum should target and address these behavioural patterns by opening platforms to debate and arguments about philosophical perspectives regarding 'being human'. The conceptual meaning of humanity advanced in the statements was that humans differ from primates, for example, chimpanzees, monkeys, and baboons because humans reason logically, think critically, evaluate, assess, make decisions, communicate ideas, and invent new knowledge and technologies according to the needs and demands of life. Being human means having qualities such as mutual respect, sharing space and resources with other people, showing sympathy, and demonstrating responsibility, care, and support.

Curriculum and pedagogy for self-reliance and freedom of choice.

The statements that highlighted the view of self-reliance critiqued the national curriculum of schools for promoting colonial social and economic goals. The elements cited from the national school curriculum were selecting subjects that do not articulate in education and training. The branding of education as "education and training" does not match the content knowledge taught from reception to the exit grade. The branding sounds as if a learner can exit the schooling system with skills and knowledge that learners require to adapt to the country's economic systems. The opposite is the mimicking and emulation of the content knowledge and pedagogic strategies enhancing the memorisation of facts from textbooks. The statements made by participants questioned the training component in the curriculum of the democratic dispensation because all subjects are classroom-based and tests and homework test fact recollection.

The proposals made from this perspective are as follows regarding the decolonised curriculum and pedagogical strategies.

The amalgamation of training to subject content knowledge

The statements indicated the importance of empowering learners in the school system with artisan skills required in their space of work. The view of self-reliance in a decolonised curriculum and pedagogy promotes the importance of differentiated interests and abilities that are entirely not in the scope and agenda of the democratic educational dispensation curriculum. The learners who fail to cope with the abstract textbook are mostly part of the indigenous communities and they continue to be neglected. As a result, the communities of street children, lost generations, and the poorest of the poor created by colonial imperialists grow. Furthermore, the lack of training to empower learners with adequate knowledge and skills creates a disadvantage for university students because they choose careers that require practical knowledge and skills. The experience of failure and the repeating of courses are the attributes seen in students from poor communities who drop out and struggle to survive.

The freedom of choice

The views and opinions classified under this category point to a lack of freedom of choice in the curriculum of the colonial and imperialist education dispensation mimicked by the democratic government. The imposed curriculum and subject content

deprive students in universities of their perspectives on the content and pedagogy. Course guides that present the scope of content are forced upon students without room to accommodate different opinions. The prescribed books, in some instances, are taught chapter by chapter, and students underline points which they memorise to pass exams. The content knowledge in some courses is outdated; for example, in accounting, how to fill out a cheque book is still taught in the dispensation of digital technology. The decolonised curriculum and pedagogy should be in favour of the students because knowledge is power and guides students towards freedom and emancipation. The analysis of the views and opinions expressed in the statements regarding the freedom of choice resonate with the profound ideas of Shor [3] on the pedagogy of the oppressed, for example, on the issue of providing a space for students to have a voice in the process of designing and developing program curricula, and the alignment of content with students' perspectives of the world, as well their needs and demands locally and globally.

Furthermore, the view of freedom of choice in the decolonised curriculum encapsulates the understanding of the rapid changes in the local and global socio-political and economic system. Thus, the importance of integrating international perspectives and achievement in the decolonised curriculum is emphasised. The sense of a global village was insinuated in the statements of participants; for example, scholarships should open gates for students to interact physically and remotely with various countries beyond European and American spheres of knowledge production. The criticism of American and European books filling up libraries in universities was highlighted to substantiate the importance of encouraging students to explore and navigate the space of knowledge according to their needs and aspirations. The examples cited in the context of knowledge were philosophical ideas generated by scholars of the liberation struggle in Africa, like Julius Nyerere, Lumumba, Nelson Mandela, Steve Biko, and others. The relevance of the philosophical ideas to the freedom of choice, as pointed out in the discussions, provides an informed framework for articulating scholarly principles for research and knowledge production to support African renaissance and Afro-centric views.

Furthermore, the perception of integrating indigenous pieces of knowledge in the curriculum for higher learning resonates with the ideas of the proponents of the rhizomatic theory, reterritorialising and de-territorialising [8–11], which advocates for the regeneration of new concepts and philosophical ideas relevant to the postcolonial societies' lifestyles and worldviews. Bignall [11] argues that the colonised and the colonisers had been in co-existence for centuries after the European imperial and colonial regimes. Therefore, from the co-existence enculturation-influence of one culture on the others is a reality. According to Bignall [11], the cultural chauvinism of the colonial powers of capturing indigenous people and their cultures and mingling them with European worldviews is socio-culturally and historically accurate. In the same vein, Muller [6] reiterates the importance of the socio-cultural and historical factors in knowledge production for equality and equity in decolonising the curriculum and pedagogy. Ideas and views provided support the argument that students demand decolonised education with a background stemmed from global and local research. The resonance of students' perspectives confirmed Mezirow's transformative learning theory on the abilities of adult learners to develop subjective critical reflective assumptions about issues of injustice in their environment. Students drew on ideas from various local and global perspectives to frame demands for decolonised education. Furthermore, the transformative theory and refection frameworks state that adult students have ideas about change to the decolonised curriculum and pedagogy.

11. Conclusion

The perspectives revealed by the study indicate the emergence of three trajectories that can be used by future educational and curriculum development researchers to embrace students' voices regarding decolonising education in South Africa and elsewhere in the world. The study concluded that experiences of university education and training from the participant's perspectives require fundamental reform. First, on the issue of curriculum design and development; second, the teaching and learning strategies; and third, the inclusion of students' voices in all the processes. Furthermore, the findings provided the basis for this study to claim that a decolonised curriculum and pedagogy must consider students' perspectives as being at the centre of all developments. The perspective of a decolonised curriculum and pedagogy is that it advocates for freedom of choice and liberation of the mind and expresses concern about the colonial curricular that is rigidly programmed and structured to constrain students' quests to inquire, undertake new adventures, and develop talents during education and training.

In a broader sense, the critique of the confinements and constraints in the current knowledge productions in higher education in the findings confirms the principle of the critical subject reflective assumption that adult learners apply logic and systemic thinking about knowledge. The issue of textbooks and knowledge content raised in the findings indicates an awareness of the promotion of colonial ideas and views that inculcate imperialist values of supremacy and the exclusion of other cultural values systems.

From the perceptions of a decolonised curriculum and pedagogy established from the synthesis of the finding within the framework of the philosophical perspectives of the global and local researchers, this work concluded that decolonisation has different connotations. The first connotation advances the notion of the restoration of the image of indigenous people by integrating their world outlooks, views, and cultural values in the curriculum and pedagogical practices. The proposed mechanism to resolve the exclusion problem is the promotion of pedagogical strategies like problem-based and inquiry-based learning.

However, the other perspectives revealed by the research depicted a trend of thought about decolonisation and decolonised curricula and pedagogy which was advanced by the proponents of *Ubuntu*. The views and ideas of replacing Eurocentric philosophical perspectives with Afro-centric ones were interpreted to align with philosophical ideas of political power and education. The historical lesson in colonial societies is that political power and education are intertwined. Political power gives the government authority to enforce the beliefs and aspirations of the dominant political power. The findings highlighted that the radical critical perspectives of a decolonised curriculum conceptualise the transformation of education to be the prerogative of the political power. This implies the assumption of political power by the indigenous liberation movement. Therefore, education should be a tool for promoting indigenous people's cultural dominance. In addition, such a perception expects those in political power to mimic the strategies and policies of the colonial rulers in the current democratic political dispensation. The conclusion from the concept of *Ubuntu* being emphasised in this perspective is that a decolonised curriculum should acknowledge and promote value systems of the indigenous people, which had for many years been excluded and degenerated. Thus, the image of the indigenous people has been fallaciously presented. The narrative of the indigenous people about their worldviews, beliefs and convictions, norms, and behavioural patterns was the subject of research of colonial powers. Thus, knowledge production through intentional cultural chauvinism dehumanises indigenous people. The

concept of the African renaissance, which is the African Union's agenda to regenerate and rebuild the indigenous value system and image of the people of African descent, was destroyed by imperial colonialism. The conclusion drawn from the findings was that there was alignment between the students' perspectives and the views and opinions gathered from the works of local researchers [16–18, 20, 21].

Lastly, the study revealed the patterns of thought held by university students about their role in the conceptualisation and development of the curriculum and knowledge production.

12. Recommendations

The findings of this study revealed the conceptual perspectives of philosophical foundations for the decolonised curriculum and pedagogy. The purpose of the study was to establish the ideas and views that influenced the student protests which featured the demand for free and decolonised education. The qualitative research design and methodology assisted this research to address the question about the ideas and theoretical perspectives that influence the demand for decolonised higher education in South Africa. However, the established perspective can be the background for further research into models which include students' perspectives on curriculum design and development in higher education.

Acknowledgements

Author details

Mamsi Ethel Khuzwayo
Cape Peninsula University of Technology, Cape Town, South Africa

*Address all correspondence to: kuzwayom@cput.ac.za

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Developments in the field of technology along with the Covid-19 pandemic have caused many significant changes and transformations in this century. As such, countries need individuals equipped with 21st-century skills. This requires schools to consider the challenges faced by both students and teachers and develop educational programs to train qualified individuals who can respond to the developments in this century and the future. This book discusses the challenges, advances, and applications in the professional development of teachers and other educators at all academic levels.

Katherine K.M. Stavropoulos,
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