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Preface

This book presents valuable research on a variety of important but rarely covered subjects providing insight and directions for both research and practice in teacher education. The chapters include new perspectives on teacher education and institutional change. Because of the complex and rich nature of teacher education, readers can engage some specific paradigms and action-oriented phenomena related to teacher education. The studies in the book address an international audience of student teachers, teachers, and decision-makers in teacher education. The book covers in-depth research in a variety of areas such as collaborative teaching experiences, creativity education in curricula, innovations in science and technology in education, learning and teaching of different subjects such as entrepreneurship, history, mathematics, science, technology, heritage, and early childhood education with new techniques and methods, and the use of online social platforms in education. In this sense, the book provides new perspectives and valuable insight into some overlooked areas in teacher education and its curricula.

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Let's Team Up! Measuring Student Teachers' Perceptions of Team Teaching Experiences

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and Ellen Vandervieren*

Abstract

Since collaboration within schools gains importance and is considered significant for teachers' professional development in order to meet the new 21st-century educational demands, teacher education institutes show a growing interest in field experiences inspired by collaborative learning, such as team teaching. Team teaching is a teaching model in which (student) teachers work collaboratively in the preparation, teaching and evaluation of a course. In order to assess team teaching practices in teacher education by monitoring perceptions of collaborative team teaching experiences, an instrument is needed that offers insights to guide the learning process and support well-founded decision making. Therefore, an easy-to-use quantitative questionnaire to explore student teachers' team teaching perceptions was developed and validated in four stages: an extensive literature review (1) resulting in a preliminary questionnaire containing advantages and disadvantages of team teaching (2). Next, a pilot study was conducted with 14 student teachers (3), followed by a further validation and reliability study based on exploratory factor analysis, peer debriefing, confirmatory factor analysis and internal consistency analysis with 181 participating student teachers (4). The final questionnaire comprises 29 Likert-items in four scales – *collaboration*, *co-creation*, *coaching* and *complexity* – and appears to be both valid and reliable.

Keywords: teacher education, field experiences, collaboration, team teaching, student teacher, perceptions, questionnaire development, questionnaire validation

1. Introduction

1.1 Collaborative teaching in teacher education

Within teacher education, field experiences are crucial in the training of future teachers [1] as they trigger learning [2]. During field experiences, student teachers are traditionally placed individually with a mentor [3], i.e., the teacher in whose classroom the internship is conducted. They start by observing their mentor and, afterwards, get the responsibility to take over the class *individually* during a number of hours [4, 5].

However, theories of cooperative learning [6] and team learning [7] underline that professional cooperation can be highly beneficial. Indeed, collaboration between teachers is significant for their professional development [8] in order to meet the new educational demands of the 21st century [9, 10]. It triggers processes

of making learning questions and goals more explicit, leads to increased motivation, and reinforces the capacity to search for answers. Moreover, it stimulates reflection on experiences as a basis to undertake action to improve professional behavior [11].

Furthermore, both schools and policy makers are seeking teaching models in which teachers are more committed to collaborating, sharing expertise and experiences, supporting each other, learning collaboratively, and enhancing their own competencies [12–14]. Those collaborative models can enhance learning by assisting teachers in responding better to learners' needs through, for example, differentiated instruction, and potentially result in improved learning outcomes [15, 16].

Consequently, since collaboration within schools gains importance and is considered significant for teachers' professional development, teacher education institutes show a growing interest in field experiences inspired by collaborative learning [17]. By collaborating with peers, student teachers can reach higher levels of performance [18]. Moreover, it may help student teachers to be better prepared for the transition to practice [19]. By hosting student teachers in pairs, opportunities for team teaching arise.

Given the long history of traditional individual student teaching, implementing team teaching as a field experience model is challenging [5]. Therefore, to assess team teaching performances in teacher education, a follow-up of the student teachers' learning processes is important to guide their professional growth. Furthermore, student teachers could also benefit from a tool to discuss their own collaboration and to indicate joint work points themselves. To that end, measuring student teachers' perceptions of collaborative team teaching experiences is relevant, as these might function as a filter [20] on the collaboration and impact of the team teaching practice. Hence, an easy-to-use valid and reliable questionnaire of student teachers' team teaching perceptions is needed.

2. Collaborative learning through team teaching

Team teaching is a collaborative teaching model that refers to two or more professionals working together in some level of collaboration in the planning, delivery, and evaluation of a course [21, 22]. Co-teaching, collaborative teaching and cooperative teaching are sometimes used synonymously with team teaching.

Team teaching, however, refers to the collaboration between teachers in order to provide quality education to *all* learners, while the other concepts may in some instances be more narrowly defined and refer to the collaboration of a (general) teacher with a special education teacher in order to help learners with specific educational needs [23, 24].

As indicated in the definition, collaboration takes place between two or more professionals. Usually two teachers are involved (i.e., two (general) teachers, or a (general) teacher and a special education teacher), but other ways of collaboration are equally possible (e.g., between three or more professionals, with a student teacher, a mentor during field experiences, a teacher trainer, a child caretaker, a paramedic, or even a larger group of teachers with specific development goals [25]).

In this study, we focus on team teaching as a field experience model applied by student teachers *during teacher education* in which the student teachers have the opportunity to team teach during practical lessons on campus or during internship lessons in schools. Within these contexts, team teaching can be applied by two student teachers, although other formats are equally possible, such as groups of more than two student teachers, a student teacher and a mentor, or a student teacher and a teacher educator. As a consequence, the questionnaire on student teachers' team teaching perceptions must be able to capture these different team teaching contexts.

3. Team teaching models

In the literature several models of team teaching are described. Differences are related to the number of models or sub-models, and the labelling [21, 26]. In this study the typology of Baeten and Simons [21] is used as it is review-based [21]. Their typology distinguishes between five team teaching models based on the level of collaboration between the team teaching partners: (1) the observation model, (2) the coaching model, (3) the assistant teaching model, (4) the equal status model – parallel teaching, sequential teaching and station teaching – and (5) the teaming model [21].

In the observation and coaching models, collaboration is limited as one teacher has full responsibility while the other observes [27, 28] or coaches [29, 30]. A higher level of collaboration becomes evident in the assistant teaching model, where one teacher has the main responsibility, but receives assistance from another teacher who provides support to the learners, uses media, etc. [27, 31]. Several teaching formats are possible in the equal status model: teachers split up the class (parallel teaching) [31], divide the learning contents (sequential teaching) [32, 33], or split up both the class and the learning contents, so that both teachers, with the same status and responsibilities, teach specific content or activities to a subgroup of learners (station teaching) [27, 34]. Finally, in the teaming model, both teachers fully collaborate during the preparation, the delivery and the evaluation of the lessons.

With regard to the application of team teaching models two important observations have to be made. First, it is important that student teachers adopt different roles within a specific model to underline the equivalence of both teaching partners involved, and to optimize the learning effect for both [35]. This recommendation applies in particular to models where one teacher assumes more responsibility, as is the case in the observation, coaching, and assistant teacher models. Second, it is important to vary between models. Several authors point to a growth path in team teaching. More experienced teams often alternate models, even within a single lesson [22, 36].

4. Research aim

Previous empirical studies have emphasized the advantages of team teaching for collaborative learning and encouraged its implementation in teacher education, as it can help offset some of the issues that affect the more traditional model of individual student teaching (for instance lack of support, teaching in isolation), and because it maximizes resources in the classroom [4, 5].

Although the advantages of team teaching for student teachers have been confirmed in multiple studies, disadvantages (for instance conflicting personalities [15, 37], time-intensive planning [38–40]) have been recognized as well. Hence, a review-based overview of the relevant advantages and disadvantages of team teaching for student teachers will be presented in the *Results* section.

Moreover, team teaching practice is related to student teachers' perceptions of team teaching [9]. A number of studies show that teachers' perceptions of collaboration have changed positively due to their experiences with team teaching [41]. Otherwise stated, student teachers' perceptions might function as a filter [20] on the team teaching practice and the accompanying actions. For instance, negative past experiences with collaboration can lead to student teachers being less open to team teaching [42]. Consequently, offering situations where student teachers can have positive team teaching experiences may be a powerful way to foster collaborative learning.

Therefore, to assess team teaching practice in teacher education, stakeholders such as student teachers, teacher educators and mentors are in need of an easy-to-use instrument offering insights into student teachers' perceptions of collaborative team teaching experiences, to guide the learning process and support well-founded decision making.

However, instruments to easily measure perceptions within team taught environments are scarce [9]. Recently, a 16 Likert-items questionnaire for learners has been validated in Belgium and South Africa: the learners' team teaching perceptions questionnaire (LTTPQ) [43]. Contrary to the focus of the current study, the LTTPQ was based on specific characteristics of team taught learning environments *for learners*, such as rich and varied lessons (i.e., variety of teaching styles, multiple perspectives on topics), increased support (i.e., less waiting time for assistance, more differentiation, additional information on learning problems), learning gains (i.e., better understanding, higher quality of school work, higher test scores) and confusion (i.e., different expectations, different responses to questions).

To the best of our knowledge, there is no valid and reliable quantitative instrument available to measure these aspects *for student teachers*. Therefore, the development of such a questionnaire would be a first attempt to quantitatively measure student teachers' team teaching perceptions.

Consequently, the aim of this study is to develop *an easy-to-use valid and reliable quantitative self-report questionnaire to measure student teachers' team teaching perceptions* (main objective), based on *a theoretical framework of student teachers' team teaching advantages and disadvantages* (sub-objective), usable within the context of all team teaching models and within different team teaching formats, regardless of student teachers' team teaching experiences. The student teachers' team teaching perceptions questionnaire (STTPQ) can be implemented as a *growth tool* in order to meet the shifted assessment focus from measuring performances to supporting professional growth [44], allowing teacher education institutes to make well-founded decisions.

5. Methodology

5.1 Research stages

The STTPQ was developed and validated in four stages: an extensive literature review (1) resulting in a preliminary version of the questionnaire containing advantages and disadvantages of team teaching (2). Next, a pilot study was conducted with 14 student teachers in order to improve content validity (3), followed by a further validation and reliability study based on exploratory factor analysis, peer debriefing, confirmatory factor analysis and internal consistency analysis with 181 student teachers (4). Hence, both quantitative and qualitative methods were applied (i.e., mixed methods) in order to increase the reliability of the instrument [45].

5.2 Research contexts and respondents

This study was deliberately conducted in two different teacher education programs in Flanders, Belgium, so that the questionnaire would be sufficiently robust for use in different contexts. The first context consisted of a one-year academic teacher education program which prepares students who have already obtained their master's degree to become secondary school teachers. The second context consisted of a three-year teacher education program, aimed at training students to obtain a bachelor's degree required for primary or lower secondary school teachers.

For the pilot study a small sample of student teachers ($N = 14$) of the first context, who did not participate in the validation study, were selected on the basis of voluntary participation. The student teachers had already applied team teaching with a peer – student teacher – during field experiences.

The validation and reliability study took place in the second context, including a larger sample of student teachers ($N = 181$). These student teachers applied different models of team teaching mainly with a peer or exceptionally with a mentor during their field experiences. In accordance with previous research, the student teachers and mentors who acted as team teaching partners were prepared for their new roles (i.e., theoretical knowledge on team teaching) [15] before internship [9]. Student teachers were randomly assigned in pairs to a placement school [18]. Next, a digital version of the STTPQ was administered at two measurement moments (MM): during (MM1; $N = 181$), and after (MM2; $N = 160$) the team teaching internship in schools.

5.3 Stage 1: theoretical framework for the STTPQ

An extensive literature review was carried out to create an inventory of all relevant advantages and disadvantages of team teaching for student teachers [21]. Five electronic databases, namely ERIC, FRANCIS, PsychInfo, Scopus and Web of Science were searched with the following terms: *team teaching*, *co-teaching*, *cooperative teaching*, *collaborative teaching* and *paired placement* combined with *teacher education*, *teacher training*, *pre-service teacher*, and *student teacher*.

By reading the abstracts of the retrieved records, relevant manuscripts were identified. In addition, the reference lists of those records were explored to search for other relevant manuscripts. The following inclusion criteria were applied: (1) The literature search started in the year 2000; (2) In order to ensure the quality of the review study, manuscripts had to be peer reviewed.

The literature review resulted in a corpus of 33 peer-reviewed manuscripts, which were read thoroughly to identify advantages and disadvantages of team teaching, and coded into themes in NVivo software. The coding process was data-driven, based on a review of the literature. The themes were further explored in the manuscripts and incorporated into a narrative review providing qualitative descriptions of student teachers' team teaching advantages and disadvantages [46].

5.4 Stage 2: preliminary STTPQ

The preliminary STTPQ was developed based on the results of the literature review. The following criteria were used for the development of the items. First, the items had to represent the advantages and disadvantages retrieved from the reviewed literature. Second, the items had to be clearly formulated (as in not interpretative). Third, the items had to be unique (as in distinctive). Last, the items had to be universal (as in understandable in different contexts). Additionally, the use of the scaling technique was applied as it offers significant benefits over the use of a single question: it increases both the validity and reliability of the scale [47, 48]. The answering statements consist of a 5-point Likert scale ranging from *I totally disagree* to *I totally agree*.

5.5 Stage 3: pilot study

A pilot study with 14 student teachers was conducted to increase the content validity of the preliminary STTPQ. Accordingly, all items were tested through cognitive interviews – a suitable technique to reveal the reasoning of respondents when answering the questions [49, 50] – by using the think-aloud method [51]. All 14 student

teachers were interviewed independently by two researchers to reduce the possibility of missing out on important information. On the basis of the 14 cognitive interviews, several adjustments were made at item level, allowing all items to be retained.

5.6 Stage 4: validity and reliability of the STTPQ

The validation and the reliability study of the STTPQ was conducted by means of a combination of exploratory factor analysis (EFA), peer debriefing, confirmatory factor analysis (CFA), and internal consistency analysis. Evidence to use the data for factor analysis was verified by the Kaiser-Meyer-Olkin test ($> 0,80$ = adequate) [52] and the Bartlett's test of sphericity. The Lavaan package (version 0,6–7) [53] and the Psych package (version 2.0.12) [54] in Rstudio (<http://www.rstudio.com/>) were used to perform the statistical analyses.

First, an EFA was conducted in order to estimate the underlying factor structure of the data, i.e., without using a pre-defined hypothesized factor structure. To this end, data of the student teachers' first measurement moment (MM1) were analyzed, using the maximum likelihood method with orthogonal rotation, in which factors – latent variables – and items – manifest variables – were retained and distinguished. Three criteria were used to determine the number of factors: (1) the Kaiser criterion (eigenvalues > 1) [55], (2) the Cattell criterion (factors before the inflection point) [56] and (3) the content criterion (theoretically comprehensible). Additionally, items that loaded high ($> 0,40$) on one factor were included. By contrast, items that loaded high on one factor ($> 0,40$) and also fairly high ($< 0,40$) on another factor, with a difference of 0,15 or less between loadings, were excluded. Next, an item-total test correlation was used to recheck item validity measures in which each item should correlate – with a minimum of 0.20 as the cutoff value – with the total scale test score [57].

Furthermore, the reliability of the retained factor structure was verified in order to exclude items that did not meet the requirements for internal consistency. In the interpretation of the internal consistency, the following Cronbach's alpha values were used: $\alpha < 0,60$ = bad; $0,60 \leq \alpha < 0,80$ = reasonable; $\alpha \geq 0,80$ = good [58].

Since a factor structure was retained without using a pre-defined hypothesized factor structure (i.e., EFA), a further theoretical fine-tuning during a peer debriefing session with four researchers was necessary to maintain content validity (i.e., sufficiently representative) and construct validity (i.e., meaningful scales). Therefore, all factors and related items were checked for internal consistency, content, scales and factors.

Subsequently, a CFA was conducted on the same data (MM1) to verify whether the data fitted the pre-defined hypothesized factor structure with the remaining items and scales. To evaluate the fit, various indices were studied: (1) the Comparative Fit Index (CFI), (2) the Tucker-Lewis Index (TLI) and (3) the Root-Mean-Square-Error-of-Approximation (RMSEA). For the CFI and the TLI, a value equal to or greater than 0,90 is a good fit [59]. Concerning the RMSEA, a cut-off value close to 0,06 is considered good [60].

Next, stepwise improvements, based on the modification indices, were added. Improvements were only made if the Akaike Information criterion (AIC) of the new model was significantly lower than before (cf. $\text{Pr}(> \text{Chisq}) < 0,05$).

Subsequently, a repeated EFA and CFA were conducted with similar data of the student teachers' second measurement moment (MM2) in order to find evidence for the pre-defined hypothesized factor structure over time. Next, an item-total test correlation was used to recheck item validity measures at MM1 and MM2. Finally, the internal consistency for both measurement moments was analyzed in order to verify the reliability of the validated items in scales.

6. Results

The results of the four different development and validation stages of the STTPQ questionnaire will be chronologically and separately presented: (1) theoretical framework of student teachers' team teaching advantages and disadvantages, (2) preliminary version of the STTPQ, (3) results of the pilot study, and (4) results of the validation and reliability study of the questionnaire.

6.1 Theoretical framework for the STTPQ: student teachers' team teaching advantages and disadvantages

Table 1 offers an overview of the advantages and disadvantages team teaching can have for student teachers, including the main references for each advantage and disadvantage that was retrieved from the literature.

The literature showed that team teaching offers several advantages to student teachers. These advantages are fourfold: (1) increased support, (2) increased dialog about learning and teaching, (3) professional growth, and (4) personal growth.

Team teaching provides *increased support* to student teachers [17, 23, 61–64]. During team teaching they experience both emotional and professional support from their peer. This can be explained by the fact that the team teaching partner is a peer and therefore at the same level, which makes it easier to share experiences and to complement each other's strengths and weaknesses. Next, team teaching provides additional opportunities to *dialog* about learning and teaching [38, 61, 65]. Student teachers ask each other's opinion, analyze their approach and discuss alternatives more frequently. Besides, team teaching stimulates *professional growth* in the domains of teaching, collaboration, and reflection [37, 41, 66, 67]. Student teachers' didactical, pedagogical and classroom management skills increase; they learn how to give each other feedback, how to plan and they reflect better on what works and what does not. Through the presence of a peer in the classroom, student teachers also experience *personal growth* [23, 68, 69]. Their sense of self-confidence and self-efficacy increases. This growth can be explained by the fact that they feel as if they are not the only one who is afraid or experiencing difficulties.

Advantages	Main references
Increased support	Bronson and Dentith (2014); Bullough et al. (2002); Carless (2016); Dee (2012); Gardiner and Robinson (2010); Kamens (2007)
Increased dialog	Birrell and Bullough (2005); Gardiner and Robinson (2009); Nokes et al. (2008)
Professional growth	Bashan and Holsblat (2012); Nguyen and Baldauf (2010); Shin et al. (2007); Stairs et al. (2009)
Personal growth	Chanmugan and Gerlach (2013); Gardiner (2010); Kamens (2007)
Disadvantages	Main references
Lack of compatibility	Bashan and Holsblat (2012); Stairs et al. (2009); Tobin et al. (2001)
Comparison between peers	Goodnough et al. (2009); Stairs et al. (2009)
Difficulty of providing constructive feedback	Parson and Stephenson (2005); Sorensen (2004)
Increased workload	Gardiner and Robinson (2011); Nokes et al. (2008); Vacilotto and Cummings (2007)

Table 1. Advantages and disadvantages of team teaching for student teachers retrieved from the literature.

Despite these advantages, four disadvantages of team teaching for student teachers are recognized as well: (1) lack of compatibility of peers, (2) comparison between peers (3) difficulty of providing constructive feedback and (4) increased workload.

A *lack of compatibility* between peers can harm the effectiveness of team teaching [37, 67, 70]. Potential problems, such as conflicting personalities, differences in opinions, differences in conceptions of teaching, a weaker peer relying too much on his partner, or an unfair workload division may hinder collaboration. *Comparison between peers* [67, 71] might occur when student teachers fear that one would outperform the other or when the mentor has a favorite student teacher who receives more attention. Some studies indicated that student teachers experience *difficulties in providing constructive feedback* [15, 72]. If student teachers do not know their peer well and if they do not have the time to build up mutual respect and trust, they are afraid to offend their peer and often only give positive and superficial feedback. Finally, some researchers reported an *increased workload* as a disadvantage [38–40] since finding time to plan lessons and reflect with the peer is challenging, but essential for team teaching.

6.2 Preliminary STTPQ

The preliminary version of the STTPQ includes 47 Likert-items organized in five scales to measure student teachers' team teaching perceptions. These five scales are based on the advantages and disadvantages of team teaching described in the theoretical framework: (1) *support* (14 items), (2) *dialog* (5 items), (3) *growth* (14 items), (4) *complexity* (6 items), and (5) *workload* (8 items). The *growth* scale includes the initial subscales *professional growth* and *personal growth*. The *complexity* scale includes three initial subscales, namely *lack of compatibility*, *comparison between peers* and *difficulty of providing constructive feedback*.

Table 2 shows the 47 items of the preliminary questionnaire with the corresponding scales. Each scale consists of at least five items, which allows removal of problematic items during the validation and reliability study.

6.3 Pilot study

The pilot study resulted in adjustments at item level. Seven items were reformulated. First, Item 6 *I found reflecting on our lessons together insightful* was reformulated in *By reflecting on the lessons with my team teaching partner, I gained more insight in my own qualities as a teacher*. Second, Item 7 *By preparing our lessons together, we dared to experiment* was reformulated in *By preparing our lessons together, we dared to experiment with new activities and approaches*. Third, Item 9 *I was tense because of the presence of my team teaching partner* was reformulated in *The presence of my team teaching partner during my lessons gave me extra stress*. Fourth, Item 16 *The presence of my team teaching partner made me feel more confident in front of the class* was reformulated in *I felt more confident thanks to the presence of my team teaching partner during the lessons*. Fifth, Item 35 *I could share my teaching experiences with my team teaching partner* was reformulated in *I discussed my teaching experiences with my team teaching partner*. Sixth, Item 37 *I have grown on a personal level (e.g., self-confidence, social skills)* was reformulated in *The team taught lessons were beneficial to my self-confidence*. Finally, Item 40 *By comparing myself with my team teaching partner I discovered my own points of improvement* was reformulated in *Teaching with my team teaching partner made me reflect on my own strengths and weaknesses as a teacher*. All seven reformulated items as well as the 40 unmodified items were used for the validation and the reliability study of the questionnaire.

No.	Item	Scale
1	I could rely on my team teaching partner for questions and concerns.	Support
2	My team teaching partner gave me professional support (e.g. ideas, useful information).	Support
3	I felt as if there was competition between my team teaching partner and I.	Complexity
4	I was concerned that my team teaching partner would teach better than me.	Complexity
5	Teaching the lessons alongside my team teaching partner made me feel at ease.	Support
6	I found reflecting on our lessons together insightful.	Growth
7	By preparing our lessons together, we dared to experiment.	Growth
8	I had enough possibilities to share my teaching experiences with my team teaching partner.	Dialog
9	I was tense because of the presence of my team teaching partner.	Support
10	The differences between my team teaching partner and I complicated our collaboration.	Complexity
11	The team teaching activities required hard work.	Workload
12	I learnt a lot by preparing the lessons with my team teaching partner.	Growth
13	My team teaching partner and I complemented each other very well.	Support
14	The collaboration with my team teaching partner was efficient.	Support
15	I felt more motivated during the team teaching activities.	Growth
16	The presence of my team teaching partner made me feel more confident in front of the class.	Growth
17	During the team teaching activities I had to memorize many things at once.	Workload
18	I had enough possibilities to exchange ideas with my team teaching partner.	Dialog
19	Without the presence of a team teaching partner, I feel more comfortable.	Support
20	During the team taught lessons I learnt things I would not have learnt during individual lessons.	Growth
21	I have learnt to give (better) constructive feedback to my team teaching partner.	Growth
22	During the team teaching activities I had to make difficult decisions.	Workload
23	The workload for a team taught lesson was high.	Workload
24	I regularly exchanged information with my team teaching partner.	Dialog
25	I got along very well with my team teaching partner.	Support
26	My team teaching partner was a source of information.	Support
27	It took a lot of time to prepare the lessons together.	Workload
28	I prefer to prepare my lessons alone instead of doing this together.	Workload
29	Thanks to the collaboration with my team teaching partner, I reflected better on what does and what does not work.	Growth
30	The collaboration with my team teaching partner made me more aware of the importance of good fellowship.	Growth
31	The competition between my team teaching partner and I complicated our collaboration.	Complexity
32	My team teaching partner gave me emotional support (e.g. encouragements, a listening ear).	Support
33	The presence of my team teaching partner made me feel more at ease.	Support

No.	Item	Scale
34	By preparing our lessons together, we dared to try out new things.	Growth
35	I could share my teaching experiences with my team teaching partner.	Dialog
36	I have had more work than if I would have given exclusively individual lessons.	Workload
37	I have grown on a personal level (e.g., self-confidence, social skills).	Growth
38	I discussed my ideas and experiences with my team teaching partner.	Dialog
39	I felt more secure by preparing the lessons together.	Support
40	By comparing myself with my team teaching partner I discovered my own points of improvement.	Growth
41	The team taught lessons required a high level of concentration and accuracy.	Workload
42	I would have felt less anxious if I only had to give individual lessons.	Support
43	My team teaching partner gave me useful feedback on my lessons.	Support
44	I had difficulties giving my opinion to my team teaching partner.	Complexity
45	The comparison between my team teaching partner and I (e.g. by pupils, by the mentor) bothered me.	Complexity
46	During the team teaching activities, I felt competent to teach.	Growth
47	The team teaching activities convinced me even more of the fact that I want to become a teacher.	Growth

Table 2.
Preliminary STTPQ including 47 Likert-items.

6.4 Validation and reliability of the STTPQ

Before conducting the analyses, all data were checked for missing data: 23,2% of the data were missing for MM1 and 12,5% for MM2. All missing data were excluded: the missing data of MM1 were extracted from the dataset of MM1 and analog for MM2. Moreover, evidence to use the data for factor analysis was confirmed by the Kaiser-Meyer-Olkin test (MM1 = 0,89; MM2 = 0,88) and the Bartlett's test of sphericity (MM1: $\chi^2 = 4113,19$, $df = 1081$, $p < 0,001$; MM2: $\chi^2 = 4464,63$, $df = 1081$, $p < 0,001$).

6.4.1 Exploratory factor analysis

The EFA revealed that a 4-factor structure is statistically valid for the questionnaire (**Table 3**). First, the scree plot showed four factors before the inflection point. Second, three factors had eigenvalues above 1 and one factor had an eigenvalue very close to 1 (i.e., 0,999). Third, the factors were theoretically comprehensible in terms of content. The four factors together explained 47% of the total variance.

At item level, there was a downgrade from 47 items to 34 items: eight items loaded insufficiently ($< 0,40$) and five items loaded highly on more than one factor. Although Item 45 had a factor load value of 0,38 just below the limit of 0,40, the item was retained as it correlated well with the overall scale (0,48). Additionally, there was a further downgrade to 33 items as shown in **Table 3**. Item 27 was excluded to improve the internal consistency of the third factor ($\alpha = 0,66 - > \alpha = 0,71$).

Consequently, the first factor includes 17 items ($\alpha = 0,95$) of the scales *support*, *growth*, *complexity* and *dialog*: 1, 2, 6, 8, 10, 12, 13, 14, 24, 25, 26, 29, 32, 34, 40, 43 and 46. The second factor comprises 8 items ($\alpha = 0,88$) of the scales *support* and *growth*: 5, 9, 15, 16, 19, 33, 39 and 42. The third factor covers four items ($\alpha = 0,71$) of the scale *workload*: 11, 17, 22 and 23, whereas the fourth factor includes four items

Rotated factor load values						
Item no	Factor 1	Factor 2	Factor 3	Factor 4	Corrected item-total correlation	Cronbach's alpha if the item is deleted
1	0,81				0,81	0,94
2	0,81				0,79	0,94
6	0,61				0,67	0,94
8	0,62				0,69	0,94
10	-0,66				0,73	0,94
12	0,52				0,64	0,94
13	0,75				0,83	0,94
14	0,75				0,78	0,94
24	0,58				0,70	0,94
25	0,76				0,79	0,94
26	0,86				0,79	0,94
29	0,45				0,54	0,95
32	0,66				0,73	0,94
34	0,51				0,62	0,94
40	0,46				0,46	0,95
43	0,77				0,76	0,94
46	0,41				0,45	0,95
5		0,83			0,78	0,85
9		-0,51			0,59	0,87
15		0,51			0,48	0,88
16		0,79			0,73	0,85
19		-0,59			0,69	0,86
33		0,77			0,80	0,85
39		0,53			0,58	0,87
42		-0,49			0,50	0,88
11			0,59		0,52	0,58
17			0,51		0,47	0,60
22			0,45		0,41	0,63
23			0,56		0,53	0,57
27			0,43		0,23	0,71
3				0,44	0,46	0,58
4				0,47	0,48	0,56
44				0,42	0,34	0,66
45				0,38	0,48	0,56
Cumulative variance	0,23	0,30	0,42	0,47		
Cronbach's alpha	0,95	0,88	0,67	0,66		

Table 3.
Results of the exploratory factor analysis and reliability analysis.

($\alpha = 0,66$) of the scale *complexity*: 3, 4, 44 and 45. All remaining items correlated well ($> 0,20$) with the total scale test score.

6.4.2 Peer debriefing

The retained 4-factor structure was subjected to a theoretical fine-tuning during a peer debriefing session, based on the literature of collaborative learning and the theoretical framework for the questionnaire. Factor 1 included 17 items of the theoretical assumed scales support, growth, complexity and dialog. This large scale comprised 6 items in which specifically the aspect of support by means of positive feelings of *collaboration* and social cohesion are central [73], whereas the remaining 11 items pointed to the aspect of deliberate and active co-creation [11]. Additionally, Factor 3 and Factor 4 could be theoretically merged as they both are disadvantages of team teaching [21].

Finally, as shown in **Table 4** the renewed four factors were labeled based on the content of the items and their underlying construct: (1) the *collaboration* scale included 6 items ($\alpha = 0,92$): 1, 10, 13, 14, 25 and 32, (2) the *co-creation* scale 11 items ($\alpha = 0,90$): 2, 6, 8, 12, 24, 26, 29, 34, 40, 43 and 46, (3) the *coaching* scale 8 items ($\alpha = 0,88$): 5, 9, 15, 16, 19, 33, 39 and 42, and (4) the *complexity* scale also 8 items ($\alpha = 0,70$): 3, 4, 11, 17, 22, 23, 44 and 45. In sum, the 4-factor structure was kept by moving some items to another factor, still resulting in 33 reliable remaining items.

6.4.3 Confirmatory factor analysis

In order to check if the data of the first measurement moment (MM1) fitted the pre-defined 4C-factor structure – *collaboration*, *co-creation*, *coaching* and *complexity* – with 33 items, a CFA was conducted. The results showed that the model did not entirely fit the data: CFI = 0,856, TLI = 0,844 and RMSEA = 0.073. Based on the modification indices, five error-covariances ($\sim\sim$) between items were included and three not unifactorial items were excluded in chronological order: (1) excluding item 44, (2) Item 3 $\sim\sim$ Item 4, (3) Item 15 $\sim\sim$ Item16, (4) Item 5 $\sim\sim$ Item 16, (5) Item 6 $\sim\sim$ Item 29, (6) excluding Item 10, (7) Item 46 $\sim\sim$ Item 11) and (8) excluding Item 9. Finally, Model 9 with 30 remaining items had an adequate fit: CFI = 0,919, TLI = 0,911 and RMSEA = 0,057 (**Table 5**). In terms of reliability, all scales showed reasonable to good overall internal consistency: *collaboration* ($\alpha = 0,90$), *co-creation* ($\alpha = 0,90$), *coaching* ($\alpha = 0,87$) and *complexity* ($\alpha = 0,69$).

6.4.4 Repeated exploratory and confirmatory factor analysis

As part of a rigorous validity check over time, a repeated EFA and CFA were conducted [74], albeit with data from the second measurement moment (MM2). The EFA of MM2 confirmed the 4-factor structure of MM1: the scree plot showed

Scale	No of items	Items	Cronbach's alpha
Collaboration	6	1, 10, 13, 14, 25, 32	0,92
Co-creation	11	2, 6, 8, 12, 24, 26, 29, 34, 40, 43, 46	0,90
Coaching	8	5, 9, 15, 16, 19, 33, 39, 42	0,88
Complexity	8	3, 4, 11, 17, 22, 23, 44, 45	0,70

Table 4.
Results of the theoretical fine-tuning.

Model	CFI	TLI	RMSEA	AIC	Pr(>Chisq)	Action
Model 1	0,856	0,844	0,073	10766		Excluding Item 44
Model 2	0,874	0,864	0,069	10336	Fit 1 - Fit2: $p < 0,01$	Item 3 ~ ~ Item 4
Model 3	0,883	0,873	0,067	10315	Fit 2 - Fit3: $p < 0,01$	Item 15 ~ ~ Item 16
Model 4	0,891	0,881	0,065	10297	Fit 3 - Fit4: $p < 0,01$	Item 5 ~ ~ Item 16
Model 5	0,899	0,890	0,062	10278	Fit 4 - Fit5: $p < 0,01$	Item 6 ~ ~ Item 29
Model 6	0,905	0,896	0,060	10265	Fit 5 - Fit6: $p < 0,01$	Excluding Item 10
Model 7	0,905	0,896	0,061	9964	Fit 6 - Fit7: $p = 0,04$	Item 46 ~ ~ Item 11
Model 8	0,911	0,902	0,059	9952	Fit 7 - Fit8: $p < 0,01$	Excluding Item 9
Model 9	0,919	0,911	0,057	9631	Fit 8 - Fit9: $p < 0,01$	

Table 5.
 Results of the modifications to Model 1: fit indices.

four factors before the inflection point and four factors had eigenvalues above 1, which explained 49% of the total variance. Next, the CFA revealed that the 4C-factor structure – *collaboration*, *co-creation*, *coaching* and *complexity* – of Model 9 with 30 items and five co-variances did not entirely fit the data: CFI = 0,814, TLI = 0,795 and RMSEA = 0,090. Therefore, Model 9 was further improved (Table 6). Based on the modification indices, eight error-covariances (~~) between items were included and one non-unifactorial item was excluded in chronological order: (1) Item 1 ~ ~ Item 2, (2) Item 12 ~ ~ Item 39, (3) Item 32 ~ ~ Item 33, (4) excluding Item 40, (5) Item 6 ~ ~ Item 43, (6) Item 2 ~ ~ Item 26, (7) Item 2 ~ ~ Item 34, (8) Item 3 ~ ~ Item 45 and (9) Item 4 ~ ~ Item 45. Finally, the retained Model 18 with 29 remaining items had an adequate fit for MM2 (CFI = 0,915, TLI = 0,904 and RMSEA = 0,063) as well as for MM1 (CFI = 0,947, TLI = 0,939 and RMSEA = 0,048).

Moreover, evidence of item validity was attained as all items for both MM1 and MM2 correlated well ($> 0,20$) with the total scale test score (Table 7). Table 7 also indicates that the reliability of all four scales of Model 18 showed reasonable to good overall internal consistency for MM1: *collaboration* ($\alpha = 0,90$), *co-creation* ($\alpha = 0,90$), *coaching* ($\alpha = 0,87$), and *complexity* ($\alpha = 0,69$). These scales also remained

Model	CFI	TLI	RMSEA	AIC	Pr(>Chisq)	Action
Model 9	0,814	0,795	0,090	10522		Item 1 ~ ~ Item 2
Model 10	0,844	0,827	0,083	10451	Fit 1 - Fit2: $p < 0,01$	Item 12 ~ ~ Item 39
Model 11	0,858	0,843	0,079	10418	Fit 2 - Fit3: $p < 0,01$	Item 32 ~ ~ Item 33
Model 12	0,869	0,854	0,076	10393	Fit 3 - Fit4: $p < 0,01$	Excluding Item 40
Model 13	0,882	0,868	0,074	10003	Fit 4 - Fit5: $p < 0,01$	Item 6 ~ ~ Item 43
Model 14	0,888	0,875	0,072	9989	Fit 5 - Fit6: $p < 0,01$	Item 2 ~ ~ Item 26
Model 15	0,895	0,882	0,070	9974	Fit 6 - Fit7: $p = 0,01$	Item 2 ~ ~ Item 34
Model 16	0,901	0,888	0,068	9961	Fit 7 - Fit8: $p < 0,01$	Item 3 ~ ~ Item 45
Model 17	0,906	0,894	0,066	9949	Fit 8 - Fit9: $p < 0,01$	Item 4 ~ ~ Item 45
Model 18	0,915	0,904	0,063	9928	Fit 9 - Fit10: $p < 0,01$	

Table 6.
 Results of the modifications to Model 9: fit indices.

Item no					
Collaboration	Co-creation	Coaching	Complexity	Corrected item-total correlation of MM1	Corrected item-total correlation of MM2
1				0,79	0,74
13				0,78	0,82
14				0,79	0,81
25				0,80	0,82
32				0,68	0,78
	2			0,77	0,66
	6			0,65	0,62
	8			0,67	0,71
	12			0,64	0,58
	24			0,70	0,71
	26			0,74	0,76
	29			0,56	0,59
	34			0,62	0,59
	43			0,71	0,72
	46			0,45	0,26
		5		0,77	0,77
		15		0,52	0,61
		16		0,75	0,78
		19		0,65	0,69
		33		0,80	0,75
		39		0,58	0,51
		42		0,47	0,61
			3	0,39	0,52
			4	0,39	0,43
			11	0,41	0,27
			17	0,39	0,40
			22	0,37	0,29
			23	0,50	0,42
			45	0,40	0,44
MM1 $\alpha = 0,90$	MM1 $\alpha = 0,90$	MM1 $\alpha = 0,87$		MM1 $\alpha = 0,69$	
MM2 $\alpha = 0,92$	MM2 $\alpha = 0,89$	MM2 $\alpha = 0,88$		MM2 $\alpha = 0,68$	

Table 7.
Results of the validity and reliability analyses for MM1 and MM2.

reliable for MM2: *collaboration* ($\alpha = 0,92$), *co-creation* ($\alpha = 0,89$), *coaching* ($\alpha = 0,88$), and *complexity* ($\alpha = 0,68$). As a result, the final questionnaire comprises 29 Likert-items in four scales and appears to be both valid and reliable over time: (1)

No.	New no.	Item	Scale
1	1	I could rely on my team teaching partner for questions and concerns.	Collaboration
2	2	My team teaching partner gave me professional support (e.g. ideas, useful information).	Co-creation
3	3	I felt as if there was competition between my team teaching partner and I.	Complexity
4	4	I was concerned that my team teaching partner would teach better than me.	Complexity
5	5	Teaching the lessons alongside my team teaching partner made me feel at ease.	Coaching
6	6	By reflecting on the lessons with my team teaching partner, I gained more insight in my own qualities as a teacher.	Co-creation
8	7	I had enough possibilities to share my teaching experiences with my team teaching partner.	Co-creation
11	8	The team teaching activities required hard work.	Complexity
12	9	I learnt a lot by preparing the lessons with my team teaching partner.	Co-creation
13	10	My team teaching partner and I complemented each other very well.	Collaboration
14	11	The collaboration with my team teaching partner was efficient.	Collaboration
15	12	I felt more motivated during the team teaching activities.	Coaching
16	13	I felt more confident thanks to the presence of my team teaching partner during the lessons.	Coaching
17	14	During the team teaching activities I had to memorize many things at once.	Complexity
19	15	Without the presence of a team teaching partner, I feel more comfortable.	Coaching
22	16	During the team teaching activities I had to make difficult decisions.	Complexity
23	17	The workload for a team taught lesson was high.	Complexity
24	18	I regularly exchanged information with my team teaching partner.	Co-creation
25	19	I got along very well with my team teaching partner.	Collaboration
26	20	My team teaching partner was a source of information.	Co-creation
29	21	Thanks to the collaboration with my team teaching partner, I reflected better on what does and what does not work.	Co-creation
32	22	My team teaching partner gave me emotional support (e.g. encouragements, a listening ear).	Collaboration
33	23	The presence of my team teaching partner made me feel more at ease.	Coaching
34	24	By preparing our lessons together, we dared to try out new things.	Co-creation
39	25	I felt more secure by preparing the lessons together.	Coaching
42	26	I would have felt less anxious if I only had to give individual lessons.	Coaching
43	27	My team teaching partner gave me useful feedback on my lessons.	Co-creation
45	28	The comparison between my team teaching partner and I (e.g. by pupils, by the mentor) bothered me.	Complexity
46	29	During the team teaching activities I felt competent to teach.	Co-creation

Table 8.
A valid and reliable 4C-STTPQ with 29 Likert-items.

collaboration (1, 13, 14, 25 and 32), (2) *co-creation* (2,6, 8, 12, 24, 26, 29, 34, 43 and 46), (3) *coaching* (5, 15, 16, 19, 33, 39 and 42), and *complexity* (3, 4, 11, 17, 22, 23 and 45).

6.5 Valid and reliable 4C-student teachers' team teaching perceptions questionnaire

The valid and reliable 4C-questionnaire is a self-report instrument that includes 29 Likert-items organized in four scales: *collaboration* (5 items), *co-creation* (10 items), *coaching* (7 items), and *complexity* (7 items), in order to measure student teachers' team teaching perceptions (**Table 8**).

7. Conclusion and discussion

Team teaching may be a powerful way to foster collaborative learning between student teachers. To support the implementation of team teaching and to assess team teaching practices in teacher education, stakeholders such as student teachers, teacher educators and mentors are in need of an instrument that offers insights into student teachers' perceptions of collaborative team teaching experiences, in order to guide the learning process and support well-founded decision making.

Therefore, the aim of this study was to develop *an easy-to-use valid and reliable quantitative self-report questionnaire to measure student teachers' team teaching perceptions*, the STTPQ, based on *a theoretical framework of student teachers' team teaching advantages and disadvantages*, usable within the context of all team teaching models and within different team teaching formats, regardless of student teachers' team teaching experiences.

Both quantitative and qualitative methods were applied in the development and validation of the STTPQ in four stages. During the first stage, a theoretical framework was developed through an extensive literature review of student teachers' team teaching advantages and disadvantages. The results showed that the advantages are fourfold: (1) emotional and professional support, (2) increased dialog about learning and teaching, (3) professional growth and (4) personal growth. Despite these advantages, four disadvantages are recognized as well: (1) lack of compatibility of peers, (2) comparison between peers, (3) difficulty of providing constructive feedback, and (4) increased workload.

In the final stage, the validation and the reliability study of the questionnaire were conducted by means of a combination of exploratory factor analysis, peer debriefing, confirmatory factor analysis, and internal consistency analysis. Factor analysis proved that the original five scales based on our literature study on the advantages and disadvantages of team teaching: (1) support, (2) dialog, (3) growth, (4) complexity and (5) workload could not be retained. Instead, a 4-factor structure with scales (1) *collaboration*, (2) *co-creation*, (3) *coaching* and (4) *complexity*, resembled best how the student teachers experienced team teaching. Two of these scales strongly related to general positive or negative feelings related to team teaching: positive or negative feelings of social cohesion based on collaboration or positive or negative feelings related to complexity and workload. Interestingly, these two dimensions resemble the model on team learning as elaborated by Van den Bossche, Gijsselaers, Segers and Kirschner (2006) with on the one hand a focus on collaborative learning as promoting understanding through *mutually shared cognition*, on the other hand the importance of group members beliefs about the interpersonal context. As the authors state: "The above-presented constructs fit into a model of collaborative work in which beliefs about the interpersonal context

shape the willingness to engage in learning behavior. Learning behavior is defined as processes of construction and co-construction of meaning, with constructive conflict as a vehicle to enhance (co-)construction. This learning behavior gives rise to mutually shared cognition, leading to higher team effectiveness.” (p. 502) [11]. Therefore, the research strand of team learning seems a promising approach to investigate the effect and underlying success factors of team teaching.

In sum, the final questionnaire comprises 29 Likert-items in four scales – *collaboration*, *co-creation*, *coaching* and *complexity* –and appears to be valid and reliable over time. Evidence of item validity was attained as all items for both measurement moments correlated well ($> 0,20$) with the total scale test score. Furthermore, the reliability of all four scales showed similar results for both measurement moments. The overall internal consistency was reasonable to good for MM1: *collaboration* ($\alpha = 0,90$), *co-creation* ($\alpha = 0,90$), *coaching* ($\alpha = 0,87$), and *complexity* ($\alpha = 0,69$), as well as for MM2: *collaboration* ($\alpha = 0,92$), *co-creation* ($\alpha = 0,89$), *coaching* ($\alpha = 0,88$), and *complexity* ($\alpha = 0,68$).

Notwithstanding this result, there are some limitations. First, the five hypothesized scales based on the literature review did not match the 4-factor structure of the first and repeated exploratory factor analyses. In addition, a number of interesting items and underlying scales that did not meet the requirements for validity and reliability had to be excluded.

Subsequently, in order to measure student teachers' team teaching perceptions regardless of their team teaching experience, it is important to use the questionnaire not only for student teachers with limited team teaching experience (as is the case in this study), but also for student teachers with more extensive team teaching experience. In order to further verify the validity and reliability of the STTPQ, the questionnaire should be administered in these contexts of teacher education as well.


The focus of this research was specifically on perceptions of team teaching by student teachers. An interesting avenue for further research could be to pilot this questionnaire in different types of educational settings, where team teaching is applied by in-service teachers and/or other educational professionals. Therefore, future research is encouraged to apply and validate the STTPQ in other educational settings.

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Development of Creative Thinking Skills in the Teaching-Learning Process

Natalia Larraz-Rábanos

Abstract

Creativity is one of the most appreciated learning skills current the XXI century. The development of creativity has been considered essential in order to achieve an effective and a high-level learning. As different approaches to its study, creativity has been defined as a result, as a process, as a construct derived from the influence of the context and of the experience and as a personality feature of human nature. The aim of this contribution is to explain the study of creativity from the mentioned approaches to achieve a comprehension of such construct. In addition, the focus has been centred on highlight the development of creativity from an educational approach, starting from the description, implication of the use and application of creative strategies in the teaching and learning processes. Finally, a brief description is made of the most important or relevant strategies found in the literature, with emphasis on the incorporation of these strategies in the problem-solving process.

Keywords: Creativity, divergent thinking, thinking skills, teaching-learning process, creative strategies

1. Introduction

Creativity is one of the most appreciated learning skills current the XXI century [1]. Creativity is conceived as a higher-order thinking skill based on complex and postformal thought concerned with the creation of new and valuable ideas [2, 3]. Higher-order thinking skills are those involved in proficient and strategic thought, and these skills comprise critical, creative and metacognitive thinking, also known as deep learning [4]. In addition, the development of creativity is today considered essential in order to achieve an effective and a high-level learning.

Despite the observed need for the development of creativity in the curriculum, there is a general tendency to reproduce teaching and learning models and a constraint on teacher's search for procedures to teach creativity, which involves little creativity development in students, with a predominance of reproductive learning [5].

Creativity is inherent in human development and his personality. It begins to be developed from the first years of school and continues into higher education and increases through the number of experiences that the individual has, and to the extent that the activity of teachers could promote it [5, 6].

Therefore, creativity has been an essential competence for the curriculum design and development. In order to answer this deal, the concept and the psychological

construct of creativity has been defined and later, its psychological process involved has been treated to implement teaching and learning strategies oriented to such ends.

2. Concept and relevant aspects of the construct of creativity

There is a consensus among scholars that creativity is not just another skill, but rather a complex process of human subjectivity that is based on a set of psychological resources that are specifically configured and regulate human behavior [7]. Contemporary researchers have expanded the concept of creativity by recognizing that creative action is a dynamic and inconclusive process and is even co-constitute with the broader social context [8].

Considering the different approaches to their study assumed by Rodhes [9], creativity has been defined as a result, as a process, as a construct derived from the influence of the context and as a personality feature of human nature.

There is not a consensus about the definition of creativity, but it has been generally accepted as the ability to do creative products. A creative product is defined as something new, original and appropriate or valued in a particular context [10–13].

Most authors advocate understanding creativity not only from the results or the products generated, but also from the process from which it is reached. In this sense, Gardner's definition can be assumed for this purpose. For Gardner, a creative person is a person who solves problems regularly, develops new products and defines issues in a field that initially is novel but ultimately becomes accepted in a particular cultural context [12]. This definition includes the four approaches to the study of creativity: personality (creative person), the process (problem solving), the context (cultural context) and finally, the product (new products).

3. Approaches to the study of creativity

3.1 Creativity as a product

Regarding the definition of creativity as a result of human activity, many authors consider creativity as the ability to do creative products, hence a creative person is one that produces creative products regularly.

A creative product is defined as something new, original and appropriate or valued in a particular context [10–13]. These characteristics have also been summarized in two fundamental aspects of creative products, which are novelty and quality, which also must involve originality and adequacy respectively [14].

- What is something new?

Is something different to the previously existing things. There is nothing totally new because something new comes from something that previously exists. Therefore, novelty will depend on the frame of reference to which it is compared. For this reason, there are degrees of novelty. It has been considered these two types of creativity besides that [15–17]:

- P-Creativity: is new with respect to oneself (personal creativity). It is also called Little- c creativity.
- H-Creativity: is new with respect to History (social creativity). It is also called Big- C creativity

Also, there are some differences between the frequency of the novelty and the context where it is generated. Therefore, it has been described four types of creativity (see **Figure 1**). According to this continuum, Kaufman and Beghetto [18] have developed the *Four C Model of Creativity* which describes two types of personal creativity (Little-c and Mini-c) and two types of social creativity (Pro-C and Big-C) which are the follows:

- Mini-c: individual/personal and everyday creativity is used to define a type of creativity involved in performances, actions or new events of daily life with personal meaning [19]. This type of category also refers to a mental or emotional internal state of creativity [20] and helps to differentiate the subjective to the objective creativity and the Mini-c from the Little-c. Hence, it is also used to distinguish between subjective and objective forms of personal creativity.
- Little-c: individual creativity that is grown as a hobby. It is associated with the innovative contributions clearly useful but not exceptional.
- Pro-C: not eminent social creativity is given in a creative profession. This kind of creativity comes from people who are creative at their work and helps to distinguish between the area of the Big-C creativity and the area of the Little-c creativity, or between the social and personal creativity.
- Big-C: eminent creativity or exceptional creativity. Is used to indicate a type of eminent and exceptional creativity that stands out in a field or domain of knowledge and is socially recognized.

This model proposes that a person could be gradually creative, in a personal level (Little-c and Mini-c) fostering creativity in everyday life. Thus, increase the possibilities to be creative on a social level (Pro-C and Big-C) to become exceptionally creative.

- What is something original?

Originality implies that a product is different from other, highly unusual or statistically rare. Furthermore, for most authors, a product may be original to varying degrees (personal, social and universal).

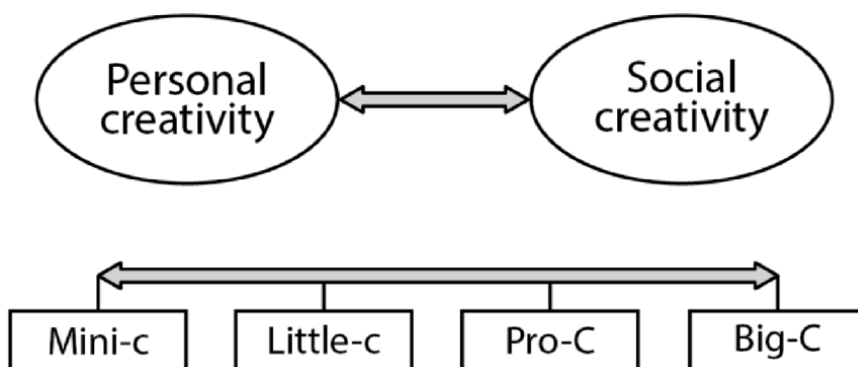


Figure 1.
Grades of creativity.

- What is appropriate or valued in a particular context?

The suitability of a product means that it is valued and/or appropriate in a particular context. To this end, a proper creative product must meet certain criteria or quality standards, providing true value or usefulness to society, culture or context in which it occurs.

As it was indicated in this section, a creative product can be creative to varying degrees (personal-social) and must meet certain levels of innovation and quality. Creative thinking skills development implies that novelty has to involve a certain level of originality, and quality must involve a certain level of adequacy in a particular social context [14].

3.2 Creativity as a process

Many authors have explained creativity as a process clearly differentiated from others cognitive process. Guilford [21] was one of the first authors to propose creative thinking as a cognitive process involved in the structure of intelligence. Today, his theoretical model remains a referent for explaining and predicting a person's creative potential and creative performance. His model of the Structure of Intellect (SOI) defined creativity as a result of a cognitive operation called divergent production, which is related to creative solutions of problems characterised by moving in many directions, in contrast to convergent thinking, characterised by moving in one direction to search for a correct answer (see **Figure 2**).

Furthermore, Guilford [21–23] proposed these four productive processes of divergent thinking:

- **Fluency:** the production of a large number of ideas. There are three types of fluency: (1) Ideational fluency: quantitative production of ideas in a given class, (2) Associational fluency: building relationships, (3) Fluency of expression: easy to build sentences.
- **Flexibility:** the ability to produce changes in thinking- a change of some kind, of meaning,-a change of meaning, interpretation or use of something, a change in the way of understanding a task or strategy intended to do it, or a change in the direction of thought, which may involve a new interpretation of the problem.
- **Originality:** the production of unusual and intelligent responses collected from premises distant or remote. In order to evaluate this component, the principle of statistical infrequency of an idea within the set of members of a given population has been proposed.
- **Elaboration:** the ability to produce the highest number of steps or details to execute a plan. It is related to the ability to make implications when planning skills are being applied.

Other authors are relevant in addressing and highlighting creativity as a specific thinking process, such as Torrance, Maslow and De Bono, among others. Torrance [24] describes creativity as the hypothesis development and validation process. Defines creativity as sensitivity to problems, deficiencies and gaps in information, the absence of certain elements, etc., which leads to formulate conjectures and hypothesis about their solution, evaluate, test and modify these assumptions to communicate the findings. Maslow [25] distinguished between two types of creative thinking and describes two types of creativity, primary and secondary. The creative process is largely composed of

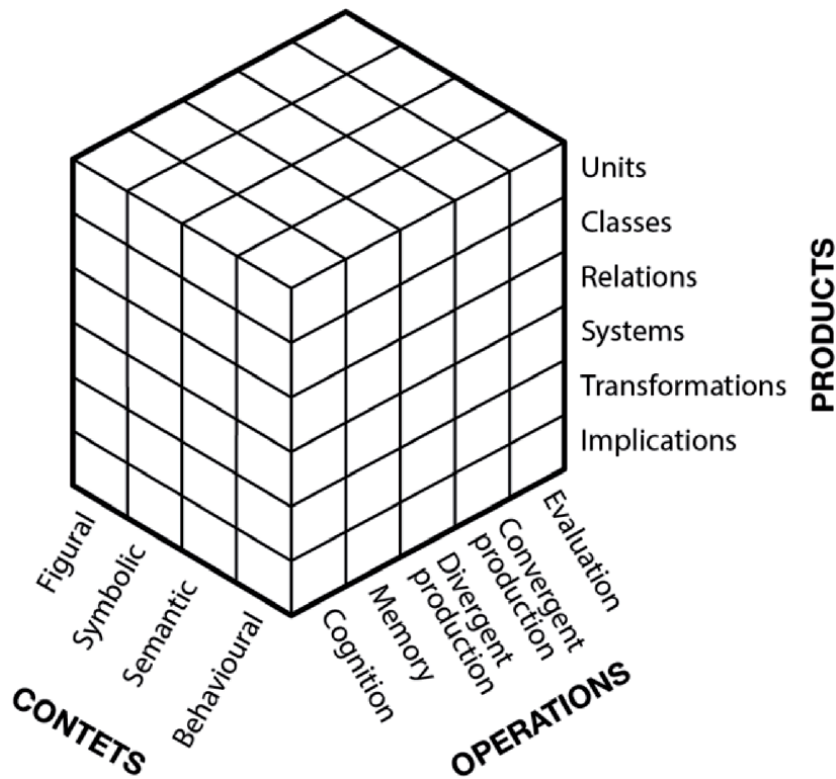


Figure 2.
 Guilford's Model Structure of Intellect (SOI).

the primary creativity, which is related to creative inspiration, and secondary creativity prepares and develops primary creativity and expresses the "finished product". Finally, De Bono [26] defined creativity as lateral thinking. Lateral thinking involves the generation of ideas, is not sequential, unpredictable and not limited by convention. Lateral thinking is the opposite of vertical thinking defined as sequential, linear, predictable and conventional. Both processes are necessary and complementary.

Hence, there are empirical evidences about two kinds of thinking, creative and critical thinking, that shows a cerebral correlate with both sides of our brain. It has been observed that both styles of thinking imply two different mental operations and processes such as: visual-verbal, parallel-vertical, unconscious-conscious, divergent-convergent, etc. Creativity is located in the right brain hemisphere and in the frontal lobe, as well as having a neurological basis of a stronger hemispheric connection, as a result of an optimal interaction between the two hemispheres. In addition, a high creative thinking ability consisting of frontal and parietal regions within default, salience, and executive brain system [27, 28].

A constant throughout the history of creativity has been to recognise the creative process as the semblance of problem solving [29]. This will be discussed in the last section of this chapter.

3.3 Creativity as an attribute of personality

There are some classic studies of the creative personality made by Mackinnon [30, 31]. Personal characteristics that performed highly creative products (buildings for architects, published works for novelists or writers) were assessed. The following characteristics of a creative person were founded:

- High intrinsic motivation to solve problems, rather intrinsic than extrinsic.
- Security and confidence, not worry about the opinion others have of them.
- Qualities for social success; they are balanced, spontaneous and confident in their social relations, while they are not particularly sociable temperament and cooperative.
- Not deliberately conformist though. They are truly independent.
- Prefer the aesthetic and theoretical values. They are searching for truth and beauty.
- Preference for intuitive perception resulting from flexibility, spontaneity and openness of mind to experience.
- Inclination towards the complex and asymmetrical.
- Two thirds of the study participants were introverts but there is no evidence that introverts are more creative than extroverts.
- According to mental health, creative individuals scored above average in the general population in certain psychological traits, but they had enough strength and mental control that allowed them to express themselves in a productive and in a creative way.

Other salient features that define the creative personality are [32, 33]:

- The flow of ideas and flexibility of thought.
- Not conventional thinking. Thoughts and associated ideas in unusual ways and use of unconventional strategies to solve problems.
- Independence and autonomy. High degree of autonomy, independence and confidence. They do not need to be seen or relied on.
- Self-discipline, self-control and perseverance. They are responsible for their own actions and have a high degree of strength and persistence to successfully finish a started project.
- High achievement motivation. They usually do not feel satisfied with their ideas or projects because they think they can improve them.
- Tolerance for ambiguity. They are more capable than most people to carry out the work in the absence of specific requirements.
- Preference for complex tasks and information.
- Strong sense of humor.

A recent meta-study highlights these same personal characteristics, emphasising awareness, flexibility of thought, abundance of ideas and their ease and the originality of ideas as the fundamental pillars of creative personality and the core

of the main studies analysed [34]. In addition, creative persons must also find four essential factors for creativity potential: affect, cognition, willingness and empathy [29].

3.4 The context in creativity

The importance of the cultural value or the context in creativity has been highlighted by different authors. The influence of the social environment for creativity development, is essential; this is what makes it possible to provide innovative solutions to the problems i.e., what surrounds the student and contributes to the development of his personality [5].

In this sense, Glăveanu [35] has presented an overview of how expanded conceptions of creativity including the context dimension can help move the field from a *He paradigm* (limited to a few select creators) to an *I paradigm* (focuses on individuals, but acknowledges that all people are capable of being creative) and toward a *We paradigm* (sociocultural an expansive focus). The *We-paradigm* starts from the idea that creativity takes place within, is constituted and influenced by the social context [8]. These more expansive views about creativity are illustrated in a recent publication of a group of active creativity scholars that outlines the key assumptions of a socio-cultural conception of creativity [36].

Csikszentmihalyi [17] defined creativity as any act, idea or product that changes an existing domain or a transformation of an existing domain into a new one, and argues that creativity is to bring something truly new that is valued enough to be added to the culture. Gardiner emphasises interdisciplinarity and collaboration for greater creativity and epistemic control of knowledge [37].

The Amabile [10] *componential model* (see **Table 1**) highlights the importance of the context in the development of creativity; such model implies the following three components of creativity:

- Domain-relevant skills. It depends on the cognitive, perceptual and motor innate skills and formal and informal education of the person in a particular domain. It includes the knowledge in a domain, the technical skills and the special skills in that domain.
- Creativity-related processes. It depends on the experience in the generation of new ideas and personality. It includes the cognitive style, the use of heuristics to generate new ideas, and the style of work.
- Intrinsic task motivation. It depends on the initial level of intrinsic motivation toward the task, on the presence or absence of social inhibitors and on the individual abilities to minimize cognitively external inhibitors. It includes attitudes toward the task and the perception of one's motivation to undertake it.

A key issue in developing creativity context-related is motivation. To develop creativity, it should be a higher intrinsic motivation than an extrinsic one. Amabile [10] attaches great importance to the influence of social factors on creativity, so that intrinsic motivation, internal evaluation in accordance with technical criteria and the absence of external rewards are crucial factors for its development. Intrinsic motivation is particularly relevant in the early stages of the idea generation or in the early stages of creativity and extrinsic motivation is particularly relevant in the developmental phase of these initial ideas, when the product needs to be developed in detail. In turn, it has been shown that extrinsic motivation can encourage the creativity as long as it does not exceed the intrinsic motivation one, and both kinds

	Domain-relevant skills	Creativity-related processes	Intrinsic task motivation
Includes	<ul style="list-style-type: none"> • Knowledge in a specific domain • Technical Skills • Specific Talent 	<ul style="list-style-type: none"> • Cognitive style • Use of heuristics • Work style 	<ul style="list-style-type: none"> • Attitudes towards the task • Perception of one's motivation to undertake a task
Depends on	<ul style="list-style-type: none"> • Innate cognitive, perceptual and motor skills • Formal and informal education in a particular domain. 	<ul style="list-style-type: none"> • Experience in the generation of new ideas • Personality Characteristics 	<ul style="list-style-type: none"> • Initial level of intrinsic motivation • Presence or absence of social inhibitors • Individual abilities to minimize cognitive external inhibitors

Table 1.
Componential Model of creativity of Amabile (1983).

of motivation should be combined in a synergistic, additive and complementary way. In other words, “extrinsic incentives and task motivation must combine in a synergistic, additive, or complementary fashion” (p. 352) [38].

According to *investment theory* [39] and *creative self-efficacy* [40], success expectations are on the basis of which students are inclined to engage in creative behavior. That is, as teachers we need to encourage positive expectations of the use of creativity, in which behavior is proven a more effective performance in a creative way compared to a non-creative.

4. Teaching methodology for creative thinking skills development

According to De la Torre [41], creative teaching is characterized by being active, motivating, dynamic and involving. For this author creative learning refers to knowledge built with the active involvement of the subject, from its planning to its internalisation, characterised by intrinsic motivation, being learner-centred, openness of the process and self-evaluation.

The development of creative thinking skills is essential for turning creative potential into creative performance. That is, if creative skills are deliberately, consciously and voluntarily fostered, each individual will be able to convert his or her creative potential into creative behavior [2, 6, 42].

In this respect, the development of creative skills must be personal and voluntary, but it must also be stimulated by the educational context. From a didactic point of view, creativity is a concept that should be addressed curricularly in the objectives, as formative content, as a strategy, in learning activities and in assessment. If not, it is reduced to a mere aspiration for a good social reception [43].

In general, it can be stated that the recommendations from research, derived from the implemented programmes and strategies for the development of creativity are based on applying divergent thinking processes (fluency, flexibility, originality and elaboration, transformation, sensitivity and symbolic play) and convergent thinking processes (analysis, synthesis and evaluation of ideas) involved in the creation of products in the problem-solving process to achieve the optimal development of creativity [2]. An important finding of a meta-analysis was that more successful training programmes were more likely concerned with directed and structured exercises aiming at developing specific, task-relevant cognitive skills

operating on available knowledge, involving idea production and cognitive training in problem solving strategies [6, 42].

There is a considerable evidence revealing beneficial effects on different facets of creative potential. Studies on creativity in education field show an effective and real development of creativity if relevant efforts are made in this direction in all levels of education from pre-school to higher education [3, 8, 44–48]. In addition, evidence has been found to suggest the importance of the role of the educator as a basis for the development of creativity and an opportunity to guide the child's early development of creativity [49]. A recent meta-study, highlights the importance and the need to explain and explore the teaching-learning processes involved in the development of creativity, identifying the techniques and procedures used [8].

Therefore, there is an insistence on the need to promote educational measures and processes that involve teachers in the development of their students' creative thinking, based on teaching methods that allow them to generate knowledge and respond to social, scientific and technological problems [50, 51]. In this regard, a systematic review of 210 studies on education and educational policy suggests that teachers' skills, attitudes, willingness to act as role models, awareness of students' needs, flexible lesson structuring and certain types of classroom interaction are central to the teaching of creativity, and highlights the importance of educational culture in supporting creativity, where it is necessary to generate conceptions of creativity and for teachers to develop their own creativity, working constructively with a mentor, as well as the importance of action research and reflection on one's own educational praxis [52].

At this point, it is stressed the importance of applying the creative thinking process in problem solving, as it would be the ideal strategy in order to develop creativity, as creativity and problem-solving have many similarities [2, 53]. Thus, is applying creative strategies in those processes that require a divergent, productive or idea-generating thinking style and analytical and evaluative strategies in those phases of the process that require a more conventional thinking or a convergent thinking style, aimed at finding a correct answer or its final elaboration.

In this section a distinction between the development of creative skills is made through overcoming the creative thinking barriers as a way to be aware of the internal and external conditioning factors of creativity, and how they are perceived in the educational context. Finally, the most relevant strategies for the development of creative skills are described in order to use them specifically in the educational context, with emphasis on problem solving.

4.1 Knowing and removing barriers to creative thinking

Simberg and Osborn [54, 55] were the first to identify and analyse barriers to creative thinking under three types of blocks: perceptual, cultural and emotional. Simberg recommended overcome these blocks and described them as follows:

- a. Perceptual blocks. Assume not to see the problem or not to see what is wrong, due to several limitations such as to isolate the problem, define the terms of the problem, use the senses to observe the problem, perceive remote relationships, investigate the obvious or distinguish between cause and effect.
- b. Emotional blocks. Are those from the individual's own insecurities, such as the fear of being wrong or looking foolish, clinging to the first idea or solution that comes to mind, rigidity of thought, high motivation to succeed quickly, excessive desire of security, fear and distrust superiors, lack of energy to solve a problem, the experience and the lack of will to implement a new solution.

- c. Cultural blocks. Are those that derive from what is taught and has learned to accept as good or bad, such as the desire to adapt to an accepted rule, the desire to be practical and economical, the tendency to adopt an attitude of all or nothing, having too many or little knowledge about something, being too competitive, having too much faith in statistics or logic, believe that fantasy is not worth it and believe that is not polite to be very curious or doubtful.

Lorna [56] describes creativity barriers as obstacles affecting the creative and innovative skills of individuals. She considers that knowledge, identification and awareness of the barriers to creative thinking, could prevent their emergence and allow for the creative potential of individuals. To this end, Lorna has created the *Inventory of Barriers to Creative Thinking and Innovative Action*.

These blocks and barriers have also been summarised in two types: internal and external barriers. Internal barriers have been related to the perceptual blocks and the emotional blocks and external ones have been related to the cultural blocks.

More recent literature provides various examples of how people can be effectively cognitively stimulated in the context of creativity enhancement, and significant performance gains psychometrically determined creativity were also seen as a result of continuous engagement in divergent thinking task [57].

4.2 Strategies to develop creative thinking skills in the classroom

From this approach, the optimal methodology for the development of creativity would be the development of students' strategic thinking through the teaching of different creative strategies in the classroom. Creative strategies are an adaptive procedure or set of procedures by which action is sequentially organized to achieve the desired purpose or goal [58]. These strategies are characterized by flexibility in planning, contextual adaptation, the creation of a relaxed and rewarding atmosphere, participatory and interactive roles among students and between students and teachers, productivity or personal achievements, high degree of satisfaction and awareness of self-learning [58]. These strategies seek, among other aspects, to develop capacities and skills of ideation, interaction, elaboration, communicative competence, argumentation to express and defend one's own points of view, collaborative work and role-playing. They are characterized by being strategies oriented towards the development of attitudes, values, emotional sensitivity and persistence in the task initiated [59].

Classic creative strategies to develop creative thinking skill began to apply in training courses from the industrial field started in 1930 and 1940. These strategies could help to unlock and stimulate the divergent thinking and facilitate the development of creativity. Nowadays these strategies are applied in the educational context in different divergent thinking tasks [57]. These creative strategies are involved in idea production which is particularly effective in improving creative-related skills [42, 60].

A way to classify the strategies outlined in the scope of the development of creativity, it has been proposed three types of processes used in problem solving [61]:

- Analogical: is based on the similarity or the likeness as a solution of the problem.
- Antithetical: is based on solving the problem of the counter tide it had been done before.

- Randomly: once discussed the problem with similar methods and opposite, there is an area of seemingly unrelated concepts to the problem and random estimates are used for their solution.

The main strategies for the development of creativity are summarised below:

- Brainstorming [55]. Its objective is to conduct a group or a project to get as many ideas, suggestions, valid alternatives and original ideas as possible. This strategy can be applied in a single phase, in which each participant prepares its own list of ideas and then be shared with other individuals, in a second phase of work in pairs and in a third phase of group work. Eventually it is needed to evaluate all the ideas and choose the best.

This strategy has four basic rules:

1. Critical judgment is excluded. Do not reject or censor any idea how absurd or strange it may seem.
 2. The free imagination is welcomed.
 3. The amount is demanded.
 4. The combination and improvement of the proposed ideas is sought.
- Attribute listing [62]. This strategy consists of moving the attributes of an object or situation to another object or situation. Its aim is to sensitise the student to grasp the characteristics of the objects and transforming them to generate significant wealth of new ones. This technique should be applied as follows:
 - Focusing on a target or topic of a potential job.
 - Display various attributes or characteristics of the target of topic (e.g., if it is an object: shape, color, size, etc.).
 - Select those attributes that best describe the object or subject.
 - Thinking about possible changes in each.
 - Modify the characteristics of an attribute without changing other attributes and see what happens.
 - Checklist [55]. This strategy is based on the formulation of questions, because the questions are one of the supports of creative attitudes. Prior knowledge of a problem predisposes to the development of questions, because knowing involves wanting to know more and this can lead to many discoveries. This strategy proposes a number of questions issued by the educator to encourage creative thinking; these are the follows:
 - Use the existing elements that have been already used for other purposes.
 - Adapt or copy other similar realities to improve what we have.

- Modify; giving new forms, colors, aspects.
- Increase, make larger, stronger, higher, that multiplies the effects or appears more often.
- Reduce; make smaller, lighter, delete parts or complications, divide or ignore.
- Replace; change something by other ingredients, materials, procedures, techniques, etc.
- Change the order or sequence of its components.
- Reverse the object; replace the positive with the negative, to start at the end, to reverse a situation, use of irony.
- Combine the ideas to improve the object.
- Synectics [63]. The word comes from Greek and means the union of different elements and seemingly irrelevant. Is applied in group problem solving to increase the possibilities of its resolution. To applied it, activities are proposed to make the strange familiar and the familiar strange through free associations, involving four forms of metaphorical analogy, which are as follow:
 - Personal analogy: imagine that you are the object or situation of the problem to identify its elements.
 - Direct analogy: look for some phenomenon or similar solution in other areas of knowledge or disciplines.
 - Symbolic analogy: interpersonal or object images are used to describe the problem. Poetical and metaphorical type of responses can be used.
 - Fantastic analogy: fantastic events, imaginary or irrational ideas can be used to challenge the established laws and to create another kind of reality.
- Invention of products [64]. This strategy proposes the creation of inventions. The strategy to develop the invention comprises the following steps:
 - Analyse the design and the creation objectives.
 - Generate ideas. New ideas from different categories, original and infrequent ideas and detailed ideas are seeking.
 - Assess the ideas generated.
 - Designing something new or improve an existing design.
- Storywriting [65]. This strategy encourage imagination by the development of stories and provides the description of different ways for it. Some of these ideas are: create stories from a word or from a randomly selected image, change the main character of a familiar story, transforming traditional stories introducing changes to its continuation or ending, imagine a fantastic character and create a story from this character (e.g., a man of glass; a man of iron), setting riddles and metaphors of their characteristics, using analogies, synectics, etc.

- Method of the Six Thinking Hats [66]. This method tries to stimulate simultaneously six different ways of thinking related to the symbolic use of six different hats, including:
 - The white hat is neutral and objective. It relates to the facts, data and objectives.
 - The red hat suggests anger and emotions. It provides the emotional standpoint.
 - The black hat is somber and serious. Is cautious and careful, says the weaknesses and difficulties of the ideas.
 - The yellow hat is cheerful and positive. It includes optimistic hope and positive thinking.
 - The green hat symbolizes the abundant, fertile growth and new ideas.
 - The blue hat is cool, symbolizes the color of the sky that is above all. It relates to the control, organization of thought processes and the use of other hats. One could assume that this hat symbolises the use of metacognition.
- Design Thinking. Design thinking offers teachers needed support and skills. Design is a process of “making” solutions, and a well-recognized by-product of creative confidence and self-efficacy. Design thinking is an iterative process that repeatedly reformulates a problem to find its core and then analyses possible solutions to find the most favourable, allowing for the formation of ‘creative bridges’ between problems and solutions [53]. Thus, both analytical thinking and divergent creative thinking are key to design processes, worked through five core design thinking skills: Empathising, Defining Problems, Ideating, Prototyping, and Testing [67].
- Creative, metacognitive and critical thinking skills problem-solving model. Adapted from Allueva [68] is based on complex thinking and higher order thinking processes in problem solving [2]. See **Figure 3**. This model stresses the importance of developing creative thinking skills in problem solving, applying creative strategies in those processes that require a divergent, productive or idea-generating style of thinking and a more analytical and evaluative strategies in those phases of the process that require a more conventional or convergent thinking, aimed at finding a suitable response or its final elaboration. Throughout all the process, metacognitive skills involved in problem-solving are proposed. In this sense, there is some recent research on the implication of metacognition for the development of creativity [37, 69].

Figure 3 shows how to apply the creative, metacognitive and critical thinking process in problem solving. First, the problem is presented and simultaneously, divergent production processes (in those tasks that require the generation of novel and valuable ideas) and convergent production processes are applied (in those tasks that require valid and reliable answers). During the task, metacognitive thinking processes (planning, regulating-controlling and checking the task). The three mentioned thinking skills are applied until a mental product of the problem is achieved.

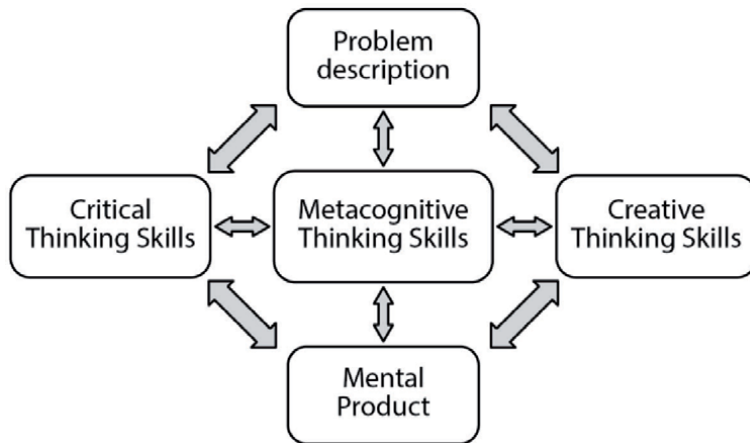


Figure 3.
Creative, metacognitive and critical thinking skills problem-solving model.

As an example, the sequence of activities in the expositive sessions is:

- a. At the beginning of the session: enquiry into prior knowledge: brainstorming, posing questions about subject content, knowledge activation questions, etc.;
- b. During the session: stimulate the creative thinking, creative strategies are proposed: brainstorming, synectics, proposing examples and counterexamples, generating lists of attributes to certain questions, visualisation, make questions, etc.;
- c. At the end of the session: relevance and educational implications in the classroom of the issues raised (creation of scenarios and narratives and search for solutions using divergent thinking skills in different cases).

The sequence of activities in the practical sessions is:

- a. Presentation of the activity through cooperative work in the classroom. Creative strategies are proposed to solve the different practical activities through the stimulation of divergent thinking and lateral thinking: "what if", creative narrative techniques, brainstorming, use of analogies, list of attributes, synectics, creative visualisation, among others. The explanation of each strategy will be done prior to the solution of the proposed activities;
- b. Development and supervision of the creative performance for the practical activities proposed;
- c. Shared discussion. Small group discussion and large group presentation of the proposals put forward, explaining the creative process carried out for their solution. To this end, the hypothesizing of possible alternative solutions will be encouraged, promoting hypothetical-deductive thinking, creative and metacognitive thinking skills are supported;
- d. Evaluation: group feedback on the creative resolution of the activity is done, suggestions for improvement of the solutions are proposed. Individual and group student's self-evaluation is carried out to analyse the creative strategies

application during the learning process. Finally, teacher's evaluation of the activity resolution (i.e., using a weighted evaluation scale) is proposed which is based on previously established evaluation criteria. Thus evaluation, should assess the main implemented creativity factors that were involved in the teaching sessions, as the indicators of creative thinking developed: fluency, flexibility, originality and elaboration, among others.

5. Conclusions

It can be affirmed that development involves skills of increasing complexity and, in general, it has been shown that human thinking is diverse, complex and multifaceted and that it requires the coordination of multiple cognitive processes.

For this reason, we highlight the importance of the development of higher order thinking skills, more specifically those that have been shown to be most effective in teaching-learning processes, namely critical, creative and metacognitive thinking skills. Traditionally, more attention has been paid in education to the development of critical, analytical or formal thinking skills, and creative thinking processes have been neglected. For this reason, it is highlight creative skills as an object of development and study in this chapter.

Creativity is a complex and multidimensional construct, which makes it difficult to define in a precise and consensual way. However, it can be affirmed that the different existing approaches to the study of creativity provide a complementary vision of creativity and shed more light for future research, which will serve to discover the mental processes and mechanisms involved in creative and human thinking and the factors that influence them.

So far, it has been highlighted the importance of creativity in society and in education, as well as the importance of creativity in everyday life, while it has been shown through research that the development of creativity can provide an improvement in educational quality and student learning. Accordingly, we believe that creative skills should be developed in all possible contexts, taking into account the personal characteristics of each student, so that they are able to generate creative products in a variety of contexts. It has also been highlighted that essential indicators of creative potential are creative thinking processes applied to problem solving in the curriculum and, more specifically, those involving divergent thinking for the generation of ideas.

From this approach, it is proposed that the development of creative thinking skills should be carried out in the different areas of the curriculum as a transversal competence and in a deliberate and specific way. Likewise, evaluation is proposed, with the intention of assessing whether their development has been effective. In order to develop creative skills and creative thinking, barriers it should be removed and it should be applied creative skills involved in the problem-solving process. The aim is to generate creative products through the use and application of creative strategies intentionally in the teaching-learning process.

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The Nature of Science and Technology in Teacher Education

Bodil Svendsen

The problems that exist in the world today cannot be solved by the level of thinking that created them (Albert Einstein)

Abstract

This chapter is about the Nature of Science (NOS) and the Nature of Technology (NOT) in education. Science includes the systematic study of the structure and actions of the physical and natural world through observation and experiment, and technology is the application of scientific knowledge for practical purposes. NOS and NOT have been used to refer to the epistemology of science, science as a way of knowing, or the values and beliefs inherent to the development of scientific knowledge. These characterizations, nevertheless, remain general, and philosophers of science, historians of science, and the same goes for NOT. Subsequently, an individual's understanding that observations are constrained by our perceptual apparatus and are characteristically theory-laden is part of that individual's understanding of the NOS and NOT. In general, NOS and NOT refers to principles and ideas which provide a description of science and technology as a way of knowing, as well as characteristics of scientific knowledge. Many of these intrinsic ideas are lost in the everyday aspects of a science classroom, resulting in students learning misaligned ideas about how science is conducted. Understanding how technology relates with science and society is critical for individuals to make informed personal and societal decisions. Nevertheless, in most STEM education contexts, learning about technology typically only means learning how to be an efficient user or, perhaps, an informed competent designer of. A meaningful technology education stresses that science education efforts also teach students about NOT. Essential questions like what technology is, how it is related to, yet distinct from, science, how it shapes and is shaped by society, and perhaps most importantly, how technologies impact the way individuals think and act.

Keywords: NOS, NOT, IBL, education, scientific- technological innovation

1. Introduction

1.1 A historical recall

The history of NOS and NOT began as early as 600–200 B.C. This was the era when the country of Greece developed as the center of learning of Western civilization. Aristotle (384–322 B.C.) was the leading philosopher of this period. The science of Aristotle is the ancestor of the modern science. Aristotle presumed observations held the key to understanding the developments of Earth and its life

forms [1]. Aristotle believed in cause and effect, and that to understand an effect we need to understand its origins and the purposes of those origins. The science of Aristotle was based on a comprehensive study of the natural world, and he tried to rationally connect his observations to the world he lived in.

The further major development of NOS and ideas about NOT took place in the Renaissance. Between the time of Aristotle and the beginning of the Renaissance, little evolution was made in scientific thinking. The Renaissance brought with it a spirit of curiosity and experimentation unseen since the time of Aristotle. The renaissance was a period of excessive intellectual growth and achievement that began in the fourteenth century and extended into the seventeenth century.

A major achievement of the Renaissance was to diverge from the idea that the universe centers on human beings [1]. Humans were believed to be part of a universe that included Earth. Renaissance scientists rejected the idea that there was a hidden purpose behind everything. An apple did not fall to the ground because of its own purpose, it fell to the ground because of gravity. The gravity is a property of matter, that it is a force between two objects. For the people of the Renaissance to realize that Earth and its life forms have properties that can be studied and understood is possibly the greatest scientific success of the Renaissance.

Since the period of the Renaissance and until today, science has developed through an unbelievable evolution. Together with discoveries and inventions the scientific method has evolved. A main feature of the scientific method is scientists attempt to look at the natural world objectively. This means that scientists try to see things as they are, without letting values or beliefs color their view [1]. This is quite unlike the early science and the science of the Renaissance. Scientific technological knowledge today is based on explanations that are confirmed by experiments [2]. The goal of science is to answer questions about our world by creating the best possible explanation that agrees with experimental results. To make findings accessible to others, scientists report all experimental results and the procedures used to obtain those results. In this way, other scientists can redo experiments to see if they get the same results. Scientists often check the work of other scientists in this way, this is what the nature of science and technology is all about [2].

2. The nature of science in education

It is quite common to introduce textbooks in science education with a section outlining “the scientific method”. This is usually done by introducing a step-by-step process that apparently must be followed in order to conduct scientific studies, according to the science curriculum [2]. A conceivable risk in this approach is not only that learning the scientific method is a misconstruction for students, but that it is also quite limiting within its range. Scientists usually do not go through the method chronologically. They often bounce around, conceivably forming a new hypothesis during experimentation. Students should learn to make good observations, inferences and understand the significant role that observations and inferences play in the development of scientific knowledge. The use of an inquiry approach for teaching within the curriculum can be supported by the fact that science is a process for generating knowledge [3]. The process rests both on making careful observations of phenomena and on creating theories for making sense out of those observations. Change in knowledge is expected because new observations may challenge dominant theories. No matter how well one theory explains a set of observations, it is possible that another theory may fit just as well or better or may fit a still wider range of observations [2].

It is important to be aware of how nature of science is being taught and why, different teaching strategies, opportunities, unique mental processes and good

examples to do this within a national curriculum that possibly not acknowledge its importance. This is challenging, yet important, as it is very often NOS themes that students find engaging and which provide a narrative to their experience of science [2]. Knowledge of NOS is as least as important in creating scientifically literate citizens as factual content knowledge.

3. The nature of technology in education

The last 30 years have been a period that has had a major impact on how technology takes radical place in human life. It is rather reasonable to say that computer technologies and the Internet are necessary for people. New methods based on Artificial Intelligence technologies generate the creation of new ideas on the horizon and propose alternative solutions to numerous different problems. Technology involves an understanding of what technology is, how and why technology is developed, how individuals and society direct, react to, and are sometimes unwittingly changed by technology. It is important to teach NOS and NOT because [2]:

- Of the need for future scientists, engineers, technologists, and others who will need a strong science and technology background for their future work.
- It is important aspect of modern culture and everyone should appreciate this aspect of culture.
- A knowledge of science and technology is needed for citizenship in modern technological societies.

Understanding how technology interacts with science is important for students to make informed personal and societal decisions. Though, STEM education contexts often learn about how technology can be useful for us to use. However, a robust technology education demands that science education efforts teach students about the nature of technology (NOT) [4]. Here it is central to learn what technology is, how it is related to, yet distinct from, science, how it shapes and is shaped by society and how technologies impact the way individuals think and act.

4. A scientific- technological approach

The process of science and technology is to challenge ideas through research [4]. Science and technology are based on fact, not opinion or preferences [2, 4]. This process focuses only on the natural world. When trying to describe the history of NOS and NOT, it can be useful to think of science and technological development as a culture in just the same way that we think of different cultural worlds such as art and music. We need to understand and talk art or music when we enter these worlds. In the same way, we need to be able to understand and talk science and technology [5]. There are made some characteristics of the nature of science that are reasonable [2, 4, 6]:

- Science is socially and culturally embedded.
- Science is subjective and theory laden
- Scientific knowledge is tentative (subject to change)

- Science is empirically based
- Science take note of the relationships between scientific theories and data
- Science is inferential, imaginative and creative.
- Science pay attention to the difference between observation and inferences.

Science trusts that the things and actions in the universe happen in consistent patterns that are understandable through careful, systematic study [6]. Science also assumes that the universe is a big single system in which the basic rules are the same everywhere. Knowledge gained from studying one part of the universe is applicable to other parts. For instance, the same principles of motion and gravitation that explain the motion of falling objects on the surface of the earth also explain the motion of the moon and the planets. With some modifications over the years, the same principles of motion have applied to other forces and to the motion of everything, from the smallest nuclear particles to the most massive stars, from chemistry to nanotechnology [4].

Science is a process for producing knowledge. This process depends on making careful observations of phenomena and on inventing theories for making sense out of those observations. In science, the testing and refining and sporadic discarding of theories, whether new or old, go on all the time [5]. Though, scientists discard the notion of achieving absolute truth and accept some uncertainty as part of nature, most scientific knowledge is well-made [1, 2]. The adjustment of ideas is standard in science, as powerful constructs tend to survive and grow more precise and to become widely accepted. For instance, in formulating the theory of relativity, Einstein did not reject the Newtonian laws of motion, but rather showed them to be an estimate of limited application within a more general concept. Change in knowledge is therefore to be expected because new observations may challenge current theories.

There has been technology as long as there have been people in the world, the techniques of shaping tools are taken as the main evidence of the beginning of human culture [4]. Overall, technology has been an influential power in the development of civilization. Technology—like language, arts, rituals, values, and business is an essential part of a cultural system and it both forms and replicates the system's values. In the world today, technology is an intricate social enterprise that includes research, design, craft, finance, manufacturing, management, labor, marketing, and maintenance. We use technology to try to change the world to suit us better.

Technology covers our capabilities to change the world: to cut, shape, or put together materials; to move things from one place to another; to reach farther with our hands, voices, and senses. However, the results of changing the world are often complex and inconsistent. They can include unexpected profits, unexpected expenses, and unexpected dangers. This may fall on different social groups at different times. Anticipating the effects of technology is thus as significant as evolving its capabilities [7].

Key principles in the area of Nature of Technology:

- Technological development involves creative thinking.
- Technology is constrained by laws of nature, such as gravity.
- Scientists are concerned with what exists in nature; engineers modify natural materials to meet human needs and wants.

- Technologies developed for one purpose are sometimes adapted to serve other purposes.
- The pace of technological change has been increasing.
- Science, technology, engineering, mathematics, and other disciplines are mutually supportive.
- Tools help people do things efficiently, accurately, and safely.
- Technology and its relationship with nature

Technology is object of studies by a wide range of philosophers, historians and sociologists, and their inquiries provide educators with extensive guidance as to which ideas about the NOT have value and which have not.

5. Scientific and technological inquiry

The matter of scientific and technological inquiry is important, and so is the importance of how to teach NOS and NOT [5, 7]. The various scientific disciplines are alike in their dependence on evidence, the use of hypothesis and theories, the kinds of logic used, and much more. However, scientists differ greatly from one another in what phenomena they investigate and in how they perform their work; in the reliance they place on historical data or on experimental findings and on qualitative or quantitative methods; in their recourse to fundamental principles; and in how much they draw on the findings of other sciences.

There is no fixed set of steps that scientists constantly follow to reach scientific knowledge. Nevertheless, there are certain features of science that give it a distinctive character as a mode of inquiry. Although those features are especially characteristic of the work of professional scientists, everyone can exercise them in thinking scientifically about many matters of interest in everyday life [2]. Scientists attempt to make sense of observations of phenomena by creating explanations for them that use, or are consistent with, currently accepted scientific principles [1]. The credibility of scientific theories frequently originates from their ability to show relationships among phenomena that earlier appeared distinct.

6. Inquiry- based teaching in science and technology education

In schools education, teaching of NOS and NOT can be done in an inquiry way, using inquiry-based learning (IBL) or by using problem-based learning (PBL) [3, 8]. IBL is basically about teachers teaching students to have a better understanding of the world in which they work, communicate, learn, and live. Teaching strategies that actively involve students in the learning process through inquiries are more likely to increase conceptual understanding [8, 9]. IBL is to be *the intentional process of diagnosing problems, critiquing experiments, distinguishing alternatives, planning investigations, researching conjectures, searching for information, constructing models, debating with peers, and forming coherent arguments* [10, 11]. Questioning and finding answers are important in IBL as aids to effectively generating knowledge [3]. However, IBL is not just about asking questions and discussing solutions; it is a way of adapting data and information into useful knowledge. Teaching strategies that actively engage students in the learning process through inquiries are more likely to increase conceptual

understandings, and there can be variable amounts of direction from the teacher, in both open and guided inquiry [3, 10, 11]. However, the debate among researchers concerning the effect of IBL to increase students' understanding of concepts is complex and the discourse around this has been a matter of discussion for many years.

Problem-based learning (PBL) is an instructional approach that has been used successfully since the seventies and continues to gain acceptance in multiple disciplines [8, 9]. It is an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem. Innovative approaches to education such as problem-based learning (PBL) and inquiry-based science learning (IBL) situate learning in problem-solving or investigations of complex phenomena [10, 11].

When students are developing their understanding of the natural and made world around them, then, like scientists, they can use inquiry to arrive at ideas and theories that help them explain what they observe. Students also have to change their ideas as they encounter new and conflicting evidence. And, like scientists too, they do not begin from a clean slate, but from what they already know and the ideas they have already [12].

Inquiring and discovery of answers are important both in PBL and in IBL as aids to create knowledge [10]. IBL and PBL argues for self-directed learning, with students taking more charge of their learning and the development of skills in self-reflection [8, 10, 11]. IBL and PBL are not just about asking questions but are a way of transforming data and information into valuable knowledge.

7. The 5E-model in education

The 5E- model has its origins in the Biological Sciences Curriculum Study (BSCS), in which American scholars developed educational programs and research on teaching and learning in science [13]. As a tool for teaching inquiry and problem-based, teachers can use the 5E model (see **Figure 1**). The five E's are the first letters

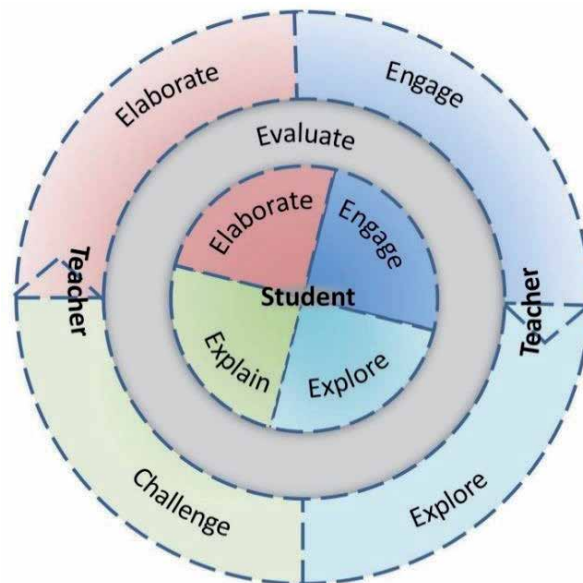


Figure 1.
The 5E model [3, 13].

in the words *engage*, *explore*, *explain*, *elaborate* and *evaluate*. The intention of the model is to be used for planning, implementation and evaluation of learning and teaching. The 5E model [3, 13] can be used to support teachers in the planning, implementation and evaluation of teaching. The model can be supportive in making inquiry-based teaching explicit and targeted.

Initially, the 5E model was an instructional model for inquiry-based science teaching (IBST) [13]. The model has been further developed at the Norwegian University of Science and Technology (NTNU) as a tool for reflective learning and teaching, using an abductive process of reflection in the cognitive learning of both teachers and students [3]. The learning process moves back and forth between the crosshatched areas as the cognitive process proceeds and develops. The 5E model is shown as a model of reflective learning and teaching (**Figure 1**).

By defining clear education aims for teaching, teachers can use the model as a reflection tool for designing, planning, implementing and evaluating their teaching sequences. Both teachers and students can determine learning objects. By shaping clear learning aims for teaching, teachers can use the model as a reflection tool for designing, planning, implementing and evaluating their teaching sequences with gifted students.

Table 1 shows the phases in the 5E-model, and the roles of the teacher and students.

In the 5E model the teachers teach by *engaging* the students with a starter. A starter should be both motivating and related to phenomena that students can relate to, like everyday phenomena. The students' former knowledge is accessed by the teacher or the curriculum, and aids students to become engaged in a concept using short activities, or introduction to phenomena in order to endorse interest and provoke prior knowledge [13]. Activity refers to both mental and physical activity [3, 13]. The activities of this phase make connections to earlier understandings and expose students' misunderstandings, they should serve to affluence cognitive differences. After the activities have engaged the students, the students need time to *explore* the ideas. Activities should be designed for the students to have shared, actual understandings upon which they continue expressing concepts, processes, and skills. The students work actively with the material (read, write, investigate, play, observe, etc.) and add knowledge and skills to reach new learning goals. This level is authentic and hands on, and the use of physical materials and existing experiences is important, but not essential. The aim of creating cognitive curiosity is to establish experiences that teachers and students can use later to introduce and discuss concepts, processes, or skills [13, 14]. Explanation provides lead-ins for teachers to introduce a concept, process, or skill. The students *explain* their understanding of the concept. An explanation from the teacher may guide them toward a deeper understanding, which is an important part of their new knowledge [3]. By enabling activities that build on the knowledge and skills the student already owns, and allow students to reflect, discuss, read and write to accomplish the learning aims, the teacher can present new thoughts that challenge student's conceptual understanding [3, 13].

Teachers have a diversity of methods and strategies at their disposal to inspire and develop student explanations [3]. Once the students have explanations and terms for their learning tasks, it is important to involve them in further experiences which extend, or *elaborate*, the concepts, processes, or skills [3, 13]. This level enables the transference of concepts to closely relate but new situations. Students' theoretical understandings and skills are challenged by their new experiences and by guidance of their teachers. They develop deeper and extensive understanding, more information, and adequate skills. Students apply their understanding of the concept by conducting supplementary activities. Elaborative activities provide further time and experiences that contribute to learning.

Assess/evaluate				
5E-phases	Teacher role	Student role	Teacher	Student
Engage	Motivate, engage, and uncover prerequisites, context, and syllabus in focus	Enabling prerequisites, be engaged and motivated, formulate questions and make hypotheses	Assess/evaluate learner knowledge, and activity in relation to learning objectives and dividend	Assess/evaluate the knowledge and expertise and what is needed in order to achieve the learning objectives.
Explore	Suggest learning resources, varying methods, guiding	New experiences through exploration to find solutions, to communicate and discuss observations and new experiences develop new knowledge and perhaps relinquish old perceptions	Assess/evaluate the learning process in relation to the learning objectives, providing feedback to students on the exploratory activity	Assess/evaluate information and observations
Explain	Let students communicate their knowledge, introduce and use terminology, challenge students' explanations and summarize student' explanations	Observe and see connections, find and formulate an argument for their own explanations, and reflect on other explanations	Assess/evaluate students explanations give feedback on student academic argumentation, focus on student outcomes	Assess/evaluate information and scientific arguments, reflect on their own understanding by comparing and understanding different explanations
Elaborate	Summarize and transfer technical material, deepen and expand to other parts of the subject, asking open questions for further exploration	Develop a deeper and broader understanding, and use new knowledge in new contexts	Provide feedback on how the student can prepare and provide feedback on student learning	Assess/evaluate the learning process in relation to syllabus, and assess/evaluate the competence in relation to the learning objectives

Table 1. Phases in model 5E, different roles (teacher/student) [3].

Evaluation should be continuous, varied, and be a part of all levels [3, 13]. Evaluation concerns the activities and has a meta perspective on them. Assessment is on the individual level and concerns self- and peer assessment, continuous assessment and final assessment of processes and products. It can be conducted orally, in writing or in a combination. Students consider their own learning and understanding, and the teacher and/or peers will assess student learning in relation to learning objectives in each subject or in an activity, and in relation to the objectives of the curriculum.

Understanding how knowledge is constructed by an individual through active thinking in the form of selective attention, organization of information, and integration with or replacement of existing knowledge, and that accepting that social interaction is necessary to create shared meaning gives NOS a deeper-rooted

affiliation in cultures [15]. Based on this approach teachers might be stimulated to analyze their own practice, develop their understanding of the impact of their practice on students' learning, and to develop new ways of teaching by reflecting in their own classes.

IBL using makerspace might give students challenges in NOS and NOT they need both academically and practically [14]. An establishment of a makerspace at school may give room for enhanced creativity for students. A makerspace is a place in which students with STEM interests, especially in computing or technology, can gather to work on projects while sharing ideas, equipment, and knowledge. Digital fabrication is one of the key activities in makerspaces equipment such as 3D-printers, laser cutters and electronic elements are often available [16]. A skill often referred to when makerspaces are discussed is creativity through inquiry [17]. The concept makerspace has become so widespread it no longer needs to include a pre-defined set of fabrication tools; the focus is rather on having a creative space, where it is possible to explore, make and tinker [18]. Makerspaces can be the spot that encourages a whole new generation of creative minds to explore and solve the big problems [16]. It might give students a chance to see what they can do when they are not limited by classroom rules and answers. Some literature [19] explicitly mentions the intention of makerspaces to stimulate interest in STEM. Creativity is a valuable resource, and a makerspace is the perfect tool to enhance and harness it [16–18].

The 5E-model and use of IBL can also contribute to stimulate to *in-depth learning*, which is about the students' gradual development of understanding of concepts, methods, and contexts within a subject area, and about understanding themes and issues that moves across areas of knowledge [14]. In-depth learning means that students use their own abilities to analyze, solve problems and reflect on their own learning to construct a lasting understanding. Learning something thoroughly and with good understanding requires active participation through their own learning processes, the use of learning strategies and the ability to assess their learning progress [20].

8. The scientific- technological innovation

Stimulating students' interest in science, technology, engineering and mathematics (STEM) has been of great concern for many years [2]. Another concern has been the need to develop 21st century skills, such as creativity, critical thinking, and collaboration, which are essential for the future [1]. Science as an enterprise has individual, social, and institutional dimensions. Scientific activity is one of the main features of the modern world [5].

As a social activity, science reflects social values and cultures. The direction of scientific research is affected by informal influences within the culture of science itself, such as prevailing opinion on what questions are most interesting or what methods of investigation are most likely to be productive [2]. In order to understand the importance of culture for human cognitive scientific development we could address Vygotsky [15]. Vygotsky developed a sociocultural approach to cognitive development. Vygotsky argued, "learning is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function" [15]. In other words, social learning tends to precede (i.e., come before) development. Vygotsky's theories stress the fundamental role of social interaction in the development of cognition [15], as he believed strongly that community plays a central role in the process of *making meaning*. For Vygotsky, the environment in which children grow up will influence how they think and what they think about.

Vygotsky assumes cognitive development varies across cultures, and the cultures need to be considered with the purpose to understand cognitive development [15].

9. Innovative teaching and learning

An establishment of a makerspace at school may give room for innovative teaching leading to enhanced creativity for students. A makerspace is a workplace in which students with STEM interests, especially in computing or technology, can gather to work on projects while sharing ideas, equipment, and knowledge. Digital fabrication is one of the key activities in makerspaces equipment such as 3D-printers, laser cutters and electronic elements are often available [17]. A skill often referred to when makerspaces are discussed is creativity [16, 17].

The concept makerspace has become widespread it no longer needs to include a pre-defined set of fabrication tools, the focus is rather on having a creative space, accessible to the public where it is possible to explore, make and tinker [16, 17].

Some literature [e.g. 19] explicitly mentions the intention of makerspaces to stimulate interest in STEM. Makerspaces can be the spot that encourages a whole new generation of creative minds to explore and solve the big problems. This opportunity of learning gives students an innovative chance to experience what they can do when they are not limited by classroom rules and answers [14].

10. Further development of NOS and NOT

It is not a question if development of science and technology will continue, but in which areas it will do so. A long-term growth of wealth will occur as a result of technological innovations. Considering NOS and NOT are essential for innovation and change and to ensure that we in the future will have a knowledge-based society that asserts itself in international rivalry [2, 21]. Many challenges in the society today are, and will increasingly be, of technological or scientific character. We need a solid basic competence in order to ensure that the development is going in the right direction, and that we will be able to enjoy the opportunities technological development will offer [11].

The world is now facing major challenges related to climate changes, medical challenges and energy needs as examples. These are challenges that cannot be answered without research and experimentation in science and technology. Scientists can bring information, insights, and analytical skills to stand on matters of public concern. They can help the public and politicians to comprehend the possible causes of events, such as natural disasters, and to predict the possible effects of projected policies i.e., such as ecological effects of various farming methods. Researchers in science can resolve exciting assignments related to for example; renewable energy, capture and storage of CO₂, nanotechnology and biotechnology. In addition, the sciences will have more impact in the future based on new technologies that will appear and affect our everyday lives.

11. Summary

NOS and NOT refers to principles and ideas which provide a description of science as a way of knowing, as well as characteristics of scientific knowledge [1, 2, 4, 5, 6]. In science and technology scientists attempting to look at the natural world objectively. Scientists attempt to make sense of observations of phenomena

by constructing explanations for them that use, or are consistent with, currently accepted scientific principles. Makerspaces as innovative learning and teaching can make students explore and solve experimental challenges [16, 17, 18].

The complex challenges that the world faces in the 21st century require a systematic reorientation of science and technology education in general [2]. The global challenges, with all their needed actions from local to global levels, need responses from science and society, and achievement will depend on the reorientation of education. Science in the future will depend on technological inventions as a mean of further development.


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Learning and Teaching Mathematics with Online Social Networks: The Case of Facebook

Yaniv Biton and Ruti Segal

Abstract

We present here a study in which a digital-based communication platform is used for collaborative work in the learning and teaching processes. In this case, we focused on Facebook as the online social network to help motivate high-school students to become well prepared for their Bagrut (matriculation) exam in mathematics. To this end, the Center for Educational Technology (CET) established a “virtual review session” on Facebook before the exam in which 614 students and 16 teachers participated. We aimed to answer two questions: what learning and teaching opportunities can Facebook offer to prepare students for the mathematics matriculation exam? and how do students and teachers perceive learning processes via social networks? Our analysis was qualitative. The findings indicate that Facebook, for one, can offer excellent learning and teaching opportunities as a result of the interactions that evolve between the students themselves and between the students and teachers. For the students, this digital social platform helps promote peer evaluation, exposes them to a wide range of questions and solutions, and fosters the development of mathematical thinking and creativity. For the teachers, it helps expand their technological and pedagogical-mathematical knowledge.

Keywords: online social network, Facebook, peer evaluation, technological knowledge, pedagogical knowledge, TPACK, mathematics teaching

1. Introduction

Social media has changed the way we consume information, produce and share data, communicate, and think. The use of online social networks by students has grown dramatically in the last decade [1–5] and many studies have investigated the potential of social media to extend learning beyond the traditional classroom (see, e.g. [2, 6, 7]). This is also true in the field of mathematics, where social media has been found to facilitate learning [8] and where both teachers and students perceive learning via social media to be innovative and collaborative [9].

In this study, we investigated what opportunities for learning and teaching could be created using Facebook to help students prepare for the final secondary-school Bagrut (matriculation) exam in mathematics. We initiated a group on Facebook that included a four-day online review project launched by the Center for Educational Technology during which students presented problems with which they were having problems. We applied a qualitative research model to analyze the

instructional interaction between the teachers and students and to determine what learning opportunities were created. Later, we examined the viewpoints of students and teachers who took part in the study group.

2. Theoretical framework

2.1 Integrating online social networks in learning processes

The potential of online social media for improving collaborative learning among students has been widely reported. These environments facilitate different kinds of learning opportunities and collaboration between students and their peers, thus increasing opportunities for constructing knowledge [10–13]. It has been shown that integrating online social networking into the education experience enhances the students' learning experience, and those who partake in groups created on Facebook, for example, for educational purposes perform better than students who do not [14, 15]. The use of social platforms and social media groups tends to increase student involvement in discussions and out-of-class communication with their teachers and peers [16] and offers support and collaboration with more advanced peers during problem-solving, which can be of great value to struggling students [17]. Some studies emphasize the considerably favorable response that students gave and others showed that asynchronous online discussion helped promote student's self-organizational abilities [18]. It also creates opportunities for participants to reorganize their knowledge, communicate knowledge in various ways [13], and promote students' self-assessments and reflections on their practice. Many students exhibit satisfaction learning in such technological environments [9] and for students with low self-esteem, the experience improves social integration and reduces learning barriers [19].

However, most of the research has focused on college and undergraduate students. Less is known about the potential of social networks to enhance learning among adolescents. Thus, the current study was designed to examine the impact social media might have on high-school students learning mathematical processes.

2.2 Teachers' technological and pedagogical content knowledge

The impact of digital technology on education in the 21st century calls on teachers to prepare for more dynamic teaching, the use of digital-based communication platforms, and collaborative work to enhance their students' critical and creative thinking and thus accelerate the learning processes required to prepare them for the challenges of life in the environment of a technological society [20]. Furthermore, teachers must become empowered professionals able to use and design technologically driven classroom environments for learning, teaching, and evaluation [21, 22].

Koehler and Mishra [22], based on Shulman [23], coined the term "TPACK" to refer to the amalgamation of the technological, pedagogical, and content knowledge, the three critical types of knowledge teachers must have. As their names imply, technological knowledge is full awareness of the various technologies available for teaching in the classroom environment, pedagogical knowledge means being skilled in the methods and instruction processes related to the teaching profession, and content knowledge is the familiarity and expertise the teacher has about the specific topic(s) being taught. Merging them together as TPACK implies that all these bodies of knowledge intersect at various levels of complexity and that teachers must have all these forms of knowledge to be able to successfully integrate

technologies into their teaching of any content area [24]. The model's complexity is reflected in merged components of knowledge. For example, TCK – technological content knowledge – which is knowledge about how technology can create different representations for a specific concept and demands that the teacher understands how using specific technologies can affect learners' skills and understanding of the relevant concepts and content; and TPK – technological pedagogical knowledge – which is familiarity with the range of technologies that can be integrated into teaching and understanding how their use can affect teaching methods. Thus, TPACK encompasses the intersection of the many types of knowledge that teachers require to integrate technologies into their teaching, no matter what the content area.

Clearly, the use of a social platform requires TPACK: the teacher must have the technological capacity to operate within the platform, the pedagogical skills to use it effectively, and (as goes without saying) the content knowledge they aim to impart to their students.

This premise formed the framework for this present study, whose aims were two-fold: to investigate the potential of the Facebook experience to influence and improve students' skills in high-level high school mathematics and to discern how mathematics teachers perceived their development of technological pedagogical content knowledge as a result of integrating the Facebook platform into their teaching. Specifically, to investigate the potential of Facebook as a digital-based communication platform tool to promote teaching and student learning, we formulated the following two research questions:

1. What learning and teaching opportunities are created when using the Facebook platform to enhance learning for the secondary school mathematics matriculation exam?
2. How do students and teachers perceive such a learning process?

3. Method

3.1 Procedure

The authors opened a Facebook forum group entitled “Facebook Marathon Mathematics Bagrut Workshop,” which was an extensive, four-day (twelve hours per day) online support project designed specifically to help 12th-grade students preparing for the intermediate or advanced mathematics Israeli *bagrut* (matriculation) exams.

The Center for Educational Technology (CET) in cooperation with the mathematics inspectorate of the Ministry of Education issued a call for students around the country to participate in this “Facebook marathon.” A total of 614 students from all over the country who were preparing for their mathematics matriculation exam responded. The students were divided into eight groups according to the level of exam (intermediate or advanced) they were intending to take.

In parallel, a call was issued for mathematics teachers who were interested in teaching over the Facebook platform. From the teachers who responded, 16 were chosen based on their experience in preparing students to sit for the matriculation exams and the recommendations of the mathematics inspectorate. We gave these teachers four hours of training during which they were taught the fundamentals of teaching in the Facebook setting and given technical instructions on how to respond on the forum. We supplied each teacher with all relevant textbook and presentations,

even if not the specific ones used in their class, so they would all be able to respond to any of the questions proposed. In addition, we provided the teachers with edited videos of teachers teaching a variety of topics from the curriculum that had been recorded in a recording studio at the CET.

The students were advised that during the marathon activity, they could raise questions about whatever topic they wished. They could post their questions by uploading photographs of the problems or providing details of the book, page, and exercise number.

The administrator of the forum ensured that each question offered was a separate thread on the forum. The teachers responded to the questions either by uploading a photo of the written solution or writing hints on how to reach it. Students were invited to comment or raise questions about that specific problem in that thread.

At the end of the four days, online questionnaires were sent to the participating students and teachers. A total of 109 students and 15 teachers submitted their questionnaires and they formed the group studied herein.

3.2 Participants

The actual participants in the study were the 15 teachers and 109 12th-grade students (98 Hebrew-speaking, 11 Arabic) who submitted the questionnaires. Of the students, 43 (40%) were preparing for the intermediate exam and 66 (60%) for the advanced.

3.3 Questionnaires

We composed two online questionnaires, one for students (see Appendix 1) and one for teachers (Appendix 2), each comprising open and closed questions. The questions in the student's questionnaire asked for details about personal background, level of examination (intermediate or advanced), and open questions regarding their reasons for joining the virtual review project and comments regarding their experience in the forum and ways in which they thought the experience could be improved. The questions in the teacher's questionnaire asked for details of their seniority and teaching experience (both traditional and online) and open questions in which they, too, were asked to write down their comments about teaching via Facebook, to describe any interactions they particularly thought worthy of mentioning (both favorable and not), their attitude toward the procedure, etc.

Each questionnaire also included closed questions: statements on a Likert scale from 1 (disagree) to 4 (strongly agree) regarding issues such as the use of technology, peer learning, willingness to continue learning/teaching similarly in the future, interactions, etc.

The validity of the questionnaire was established by a team of three scholars who are experts in mathematics education.

3.4 Interviews

We conducted a semi-structured interview based on Creswell [25] with two teachers chosen at random in order to deepen our insights regarding the response of the students and teachers to the questionnaires, as well as complete information regarding the interactions between the students themselves and between the students and teachers in the Facebook environment. The interviews were conducted online over Zoom and transcribed. The interviews were based on prepared

questions such as “What learning opportunities did you identify in the Facebook environment compared to the classroom environment?” and “Did the interaction with the students in the Facebook environment contribute to your teaching in the classroom environment?” but allowed for free discussion.

3.5 Data analysis

The data were collected and sorted based on a qualitative research paradigm [26] that employs open and axial coding processes to identify main and subcategories [27, 28]. The analysis process took place in three stages. First, the answers to the open-ended questions from the student and teacher questionnaires were analyzed using open coding analysis strategies [28]. Four themes emerged from this: statements relating to student–student interaction, statements relating to teacher–student interaction, statements relating to learning processes via Facebook, and statements relating to teaching processes via Facebook. Further to this analysis, we encoded the data [25] in each of the themes to identify secondary codes in order to gain deeper insight into the categories related to learning and teaching in the Facebook environment. These secondary codes were analyzed by three mathematics education experts to improve validity. Discussion continued until 100% agreement was achieved between the experts regarding the categorization of the data.

In the second stage, the interviews with the two teachers were analyzed to clarify the findings that emerged in the first stage, and the categories were classified accordingly. In the third stage, we searched for evidence in the Facebook correspondence to reinforce the findings from the analyses in the first and second stages, and define the final categories.

Reliability was ensured by triangulating the data obtained from the students and teachers and crosschecking the information acquired in the questionnaires and teacher interviews, along with retrospective observations of actual peer-to-peer and student-teacher participant behavior via Facebook.

4. Results

4.1 Using social networks for facilitating mathematics learning

Content analysis was made of the student-teacher interactions and peer-to-peer learning opportunities that arose.

An overall analysis of the posts revealed a total of five ways in which learning was facilitated. Two were student-oriented and included 1) evaluating peers’ solutions and 2) exposure to peer’s questions. The other three were teacher-oriented: 3) critical reading of teacher’s solutions, 4) using teacher-provided scaffolding to arrive at the solution, and 5) asking the teacher content-related questions.

4.1.1 Evaluating peers’ solutions

The Facebook platform was meant to furnish a type of review wherein the students posted their solutions to various mathematical problems, intending that the teacher would evaluate their work and point out any mistakes they had made either in calculations or in the method. Interestingly, we observed that while waiting for the teacher’s response, other students would offer help in pinpointing the source of their peer’s error(s). These students’ attempts would then start a chain of responses until the teacher answered the question.

Figure 1 presents an example of a solution uploaded by one student (A). This is followed by an excerpt from the forum where another student (B) offered help before the teacher had a chance to respond.¹

B: I think you made a mistake with the angle QAC. Shouldn't it be 90 minus half alpha?

A: Yes, you are right. And that changes them all to 90 minus half alpha ... So it's the same proof, I simply need to change the alpha to half alpha ... right?

B: Yes, you got it, great. 😊 Also, I think that generally, you cannot say that $AC = AB$ is given. Right?

A: I meant $BR = RC$

A: I've got too many mistakes 😊.

B: Aaah. Now it all makes sense! It's not so bad. It's a mini mistake!

We noticed, in fact, that throughout the sessions on the forum, students had considerable success in taking the teacher's role and providing explanations, an observation strengthened by the students' answers to the questionnaire at the end of the review session. In fact, 72% (N = 104) stated in the questionnaires that they had learned from responses given by their peers.

4.1.2 Exposure to peers' questions

Throughout the review session, students were exposed to questions raised by other students and tried to answer these questions themselves. Exposure to peers' questions expanded the available pool of exercises and presented additional

$AB = AC$ given
 $PA = PB$ given
 $AQ = QC$ given
 $\angle AQC = \alpha$
 $\Rightarrow \angle QAC = \angle QCA = 90 - \alpha$
 $\Rightarrow \angle BRC = \alpha$ similar triangles so angles are equal
 $\Rightarrow \angle RBC = 90 - \alpha = \angle BCR$
 $\angle RCA = \beta$
 $\Rightarrow \angle QCR = 90 - \alpha - \beta$ subtracting angles
 $\Rightarrow \angle ACB = 90 - \alpha - \beta$ " "
 $\Rightarrow \angle QCR = \angle ACB$

Triangles APB, ACQ, BCR are similar isosceles triangles whose bases are the sides of triangle ABC. Prove: $\angle ACB = \angle QCR$

Figure 1. A geometric problem with a student's solution as uploaded on the forum.

¹ Note: The text of the students' dialog was originally published in: Biton Y, Hershkovitz S, Hoch M. Learning with Facebook: Preparing for the Mathematics Bagrut—A Case Study. Proceedings of the 38th Conference of the International Group for the Psychology of Mathematics Education and the 36th Conference of the North American Chapter of the Psychology of Mathematics Education; Vancouver, Canada, July 2014.

mathematical problems that were often challenging and difficult. This finding is supported by student responses in the questionnaires where 78% reported that they learned by observing questions raised by other students.

Following is an example of a dialog that developed from a student's question (S) and how other students (A and N) helped out. Student "S" refers to the following problem (of which only the relevant sections are replicated here).

A sequence of $2n + 1$ numbers satisfies the following conditions:

$$a_1 = 10, a_n + 1 = 5a_n.$$

- a. Express in terms of n the sum of the terms in the even-numbered places.
- b. The last term in the sequence is 3,906,250.

Calculate:

1. the sum of the terms in the even-numbered places
2. the sum of the terms in the odd-numbered places
3. the term in the middle of the sequence

The student posted the following:

S: What am I not understanding here? I need help with a general understanding of this problem. It's clear to me that the sequence is geometric and that q is 5... The general term, according to the given information, should be $a_n = 10 \cdot 5^{2n+1-1}$ which means that a_2 is 6,250. It's clear that's incorrect because it should be 50, but I would be happy for an explanation of what I am not understanding here, and for the solution. Thanks.

We can see that S recognizes that the sequence is geometric and knows the formula for the general term in a geometric sequence $a_n = a_1 \cdot q^{n-1}$. However, he substitutes $2n + 1$ for n in the formula thus finding the last term instead of the general term.

A replies to S, and the following dialog takes place:

A: The general term in a geometric sequence is $a_n = a_1 \cdot q^{n-1}$ and so $a_2 = 10 \cdot 5^1 = 50$.

S: Right, but here the last term is in place $2n + 1$.

A: That does not change anything buddy.

S: I'm pretty sure it does because in section b you have to use the general term $a_n = 10 \cdot 5^{2n}$.

A: That formula is for every geometric sequence. The number of terms does not matter for this formula, only for the sum formula.

S: I'm pretty sure you are wrong. Let us wait for one of the tutors to answer.

A is determined to help S and tries to fine-tune the mathematical language he uses in his explanation. S appears doubtful but is grateful for A's efforts.

A: Okay, but there you are looking at the sum of terms. You asked what's a_2 ?

S: Let us wait for an answer. I want to be sure. But, thanks, pal.

A: I think I understand what your problem is... The $n-1$ in the power of q is not according to the number of terms in the sequence but the place of the term in the sequence.

A: And if you want to find the value of a_2 you need to do $q^{(2-1)}$

At the end of the discussion, N joins in as follows:

N: In my opinion, if you substitute 2 in the first formula given $a_{n+1} = 5a_n$ you get $a_2 = a_1 \cdot 5$, that is $10 \cdot 5 = 50$.

S: Right, that's clear, but I'm trying to understand why the formula for the general term, and it's correct, does not give me $a_2 = 50$.

We can see from this exchange that N had been following the discussion and now enters in to suggest a different strategy. S accepts this answer as correct but still wants to understand where his mistake lies. At this stage N understands S's request and formulates his question clearly and in a mathematically correct form as follows:

N: Why not? It works out terrific ... If I understood you correctly you meant the formula for the general term $a_n = a_1 \cdot q^{n-1}$ where you substituted $2n + 1$ for n . If so, I can help.

S: Yes. That's what I meant.

N: Terrific. So $a_{2n+1} = a_1 \cdot q^{2n+1-1}$ and that's equal to $a_{2n+1} = a_1 \cdot q^{2n}$ and then if you want a_2 your n will have to be $1/2$ and then $a_2 = a_1 \cdot q^{2 \cdot 1/2}$ and that works out $a_2 = a_1 \cdot q^1$ and that's exactly right if you substitute the givens and you do get $a_2 = 50$. I hope you understood me.

N has shown S how the correct answer can be obtained using his method. S now understands and clarifies his mistake in his own words:

S: Wow thanks a lot!! All the time I read the general term to be a_n instead of a_{2n+1} . Thank you. I was getting stressed out.

N: Hey – my pleasure. Just glad I was able to help.

From an analysis of the above dialog, we can observe the learning opportunities that occurred among the students, particularly observing their peer's misconceptions (in this case, the connection between the general term of the sequence and the number you need to replace for n to find a particular term of the sequence). The combination of giving explanations and asking questions, alongside the perseverance and motivation of S to understand the source of his error and the desire of his peers (A and N) to help him, enhanced the mathematical discourse and enriched the students' understanding of the topic.

4.1.3 Critical reading of teachers' solutions

The most significant learning opportunities that occurred during the online forum sessions were the chances to read, analyze, and understand the teachers' solutions on the forum. In some of the posts it is evident that after inspecting the teachers' solution, the students returned to their own to compare the two methods.

As an interesting aside, at the end of this post, an error was found in the book thanks to one student's "stubbornness," which we show below.

S: Thanks [for your explanation]. But somehow in the answer, there is $3/4$ instead of $3 \sqrt{3}$ divided by 2. And according to the volume of the prism that you [the teacher] found, I got the correct t but the maximum volume is different. Maybe there is a mistake in the exercise? Can you please send me the rest of the solution? Because I did not get the same answer ...

4.1.4 Coping with scaffolding (no crutches!)

In most cases, the teachers did not simply provide a solution to the problem for the students. Instead, they tried to direct the student to a different (more correct) approach to the problem to allow them to make their own progress. In fact, 87% of the students claimed that the teachers' tips helped them arrive at a solution on their own.

In the excerpt below, we see how one teacher gave a hint to lead to the solution and the student's satisfied response that it did help solve the problem.

T: I think you should try to finish this on your own. If you do not succeed, let me know and I'll post the solution. But here is a tip: the lateral area is the sum of the areas of the rectangular faces without the bases.

S: Thank you very much! I tried that and now I got it right! 😊.

4.1.5 Asking questions

Throughout the review sessions and in addition to their posting problems as photos or text, the students also asked concrete questions on particular parts of a solution and expressed any doubts that arose during a solution. The advantage here is that in contrast to questions asked face-to-face, asking questions on-line requires another skill – the ability to formulate a concise question *in writing* with enough clarity to allow the teacher to provide the necessary help to solve the problem.

The following excerpt shows a student's questions *after* a solution to a problem was posted by the teacher. It shows a search for a logical explanation or proof, indicating that the student read the solution critically.

S: It's not clear to me how you can deduce from the sketch of the graph alone that there is no maxima or minima? Who says there is not one before the asymptote? And how can you tell without a table if the function is increasing or decreasing from the asymptote? Thanks!!

4.2 Teachers' and students' perceptions of the potential of the social network to enhance learning

Analysis of the data showed that students' and teachers' perceptions regarding the use of Facebook in preparing for the exam were mostly positive. In general, the student participants' responses indicate great satisfaction. 75% (N = 81) of the 109 students who completed the questionnaire stated that it was easy for them to ask

Outcome based on category	Student testimony	Teacher testimony
Motivation for learning	I'm glad I got the chance to learn for the exam via the Facebook forum. It helped me not give up like I usually do, but to solve exercises that I could not solve on my own. Being able to ask the teacher for solutions really helped me.	I liked the fact that the students asked relevant questions and did not give up until they understood.
Peer learning	The forum was a very good idea. We could learn from other students' questions and answers.	A student posted a question and I noticed that students started to help him in the forum. They really helped him solve some parts of it on his own.
Technology utilization	I would recommend improving the method of posting pictures on Facebook.	The idea of photographing the problem or the solution and posting is brilliant! It's very cost-effective in terms of time and resources. It's very useful for presenting the solution.
Supportive learning climate	I would be very happy to get this kind of help throughout the year. It is above and beyond what a student needs to succeed. Thank you so much for all the help.	The students' appreciation was heart-warming.

Table 1. Some example of students' and teachers' responses to the questionnaire about utilizing Facebook in preparing for the mathematics matriculation exam.

questions and receive replies through Facebook, 79% stated that they would like to use Facebook this way for learning other subjects too, and 87% stated that they would like to continue learning similarly throughout the year. With respect to the teachers, all but one (93%, $N = 14$) stated that the environment encourages meaningful learning, that the project justified the investment of resources, and that they would be interested in opening similar learning environments for their students during the year. There was 100% agreement on their willingness to continue similarly next year.

Table 1 presents some examples of students' and teachers' responses to the open questions, categorized into "motivation for learning," "peer learning," "technology utilization," and "supportive learning climate."

Some criticism of the technology was heard from both students and teachers, particularly with respect to the clarity of the pictures uploaded to the forum. Also, teachers raised the need for extra staff to help manage the responses where necessary.

5. Discussion and conclusions

The findings indicate that students showed great satisfaction with the opportunity given them to study for the mathematics matriculation exam through the medium of Facebook. The Facebook forum encouraged different kinds of learning opportunities and promoted interaction between teachers and students and between the students themselves [10–13] to formulate answers for problematic questions by allowing them a user-friendly platform to ask questions, learn from peers, be exposed to different methods of problem-solving, and critically read the solutions given by the teachers. The environment seemed to motivate them to deal with questions their peers found difficult and make an effort to help. They were also exposed to questions from different textbooks and to solution methods that differed from what they may have received from their own teachers. These learning opportunities carry extra value and seem to be important in the learning process leading up to the matriculation exam. In fact, they would certainly be valuable for any learning situation, not just before an exam and not just for mathematics.

The findings showing the students' positive opinions of learning in the Facebook environment strengthen the findings of earlier studies about learning on social networks [9]. The fact that all the teachers declared their intention to adopt a similar environment in the future – both when teaching during the school year and when preparing their students for matriculation – also indicates their great satisfaction with the Facebook environment.

Responses from the teachers indicate that they felt they expanded their TPK by identifying the added value of learning and teaching through Facebook and that it served as a viable tool for accelerating social interaction, thus encouraging active learning among students. This was evident to them whether a student raised a question and examined the range of solution strategies offered to them or whether a student read the solutions to problems raised by other students and compared the different ways that that problem could be solved.

Another addition to the teachers' TPK was that they were introduced – or became more familiar - with an important technology that promotes student–student or student-teacher interaction that is quite different from that of the traditional classroom environment. The teachers indicated that it was one that they felt they would like to continue to integrate into their teaching as they saw Facebook as an environment that not only benefitted social interaction but also social interaction for the purpose of learning. In other words, they now identified the social network

as a means of not only accelerating pedagogical goals and their students' learning process, but a way of sharing knowledge and encouraging critical thinking. It allowed them to identify difficulties and misconceptions that students can have and created an optimal climate for conducting an ongoing dialog with their students that motivates them to build knowledge. They also indicated that the experience increased their understanding of how Facebook, as a social platform, can affect their teaching methods and expand their TPK in the context of the intelligent use of technology.

Our findings suggest that a good recommendation would be to include the use of this and other social media in teacher education programs within the TPACK model. In other words, to introduce teachers to the technological learning environments that are available to them and their students that can invite student-student interaction so that they can assist each other in solving complex tasks, thereby enhancing their perspective of the numerous ways available to solve a specific problem, expand their mathematical knowledge, and increase their chances of success.

The results encourage further research into these and other aspects related to teaching with the aid of social media platforms by testing them on larger groups of teachers and students, for longer periods, and on different social networking environments. Such studies would likely lead to more extensive peer-to-peer learning – not only among students but also among the teachers themselves. For example, teachers might discuss how to characterize students' questions and the like. Continued research demonstrating the usefulness of such platforms might also provide educational policymakers with an understanding of the value of investing in similar projects in the future.

In conclusion, the value of the forum was threefold: it exposed students to broader content and various teaching approaches to explain that content that differed from what they were familiar with from their own classroom; it gave students the opportunity to discuss problem-solving issues with other students who were not their immediate peers, leading to a broad array of learning opportunities and a chance to “play teacher” and help their peers; and it allowed teachers to observe a wide variety of student responses, thereby allowing them to identify additional difficulties that might be encountered by students and incorporate such insights into their own classroom.

A. Appendix 1 – Students questionnaire

Part I: Closed questions.

Following your experience in the Facebook math marathon, to what extent do you agree or disagree with each of the following statements?

(1- disagree, 2- agree to an extent, 3- agree, 4- completely agree).

a. I learned from other students' questions too.	1 2 3 4
b. I learned from solutions received by other students.	1 2 3 4
c. I would have loved to have a marathon-style group on Facebook throughout the year	1 2 3 4
d. The responses I got by the teachers encouraged me to continue practicing.	1 2 3 4
e. It was easy for me to notice an error I made after I got the solution from the marathon team.	1 2 3 4
f. It was important for me to see different teachers' approaches to solving exercises.	1 2 3 4
g. I learned from responses I got from other students.	1 2 3 4
h. The tips given by the marathon teachers contributed to my learning.	1 2 3 4

i.	I would rather meet a math teacher face to face to ask questions.	1 2 3 4
j.	Using Facebook during the marathon distracted me from concentrating on learning.	1 2 3 4
k.	It would be worthwhile using the social network platform in other subjects.	1 2 3 4
l.	The Facebook marathon and private lessons serve me the same way.	1 2 3 4
m.	It was easy for me to send questions as I sent them in the Facebook group.	1 2 3 4

Part II — Open questions

1. Did you encounter any technical difficulties entering the group?
2. What would you recommend to improve this activity?
3. What things would you not change in this activity?

B. Appendix 2 – Teachers questionnaire

Part I — Closed Questions

1. Which groups did you accompany in the Facebook marathon? (choose one)
Intermediate, advanced.
2. What previous experience do you have using a computer in instruction: school site, social network, computer software, not at all, other _____

Following your experience in the Facebook math marathon, to what extent do you agree with each of the following:

(1- disagree, 2- agree to an extent, 3- agree, 4- completely agree).

a.	The use of a social network such as this Facebook marathon allows significant learning for students.	1 2 3 4
b.	The use of a social network such as this Facebook marathon justifies the investment of resources.	1 2 3 4
c.	I would recommend holding such a Facebook marathon in future years.	1 2 3 4
d.	Technologically, it's easy for me to reply to students' questions via the social network as is done in the current marathon.	1 2 3 4
e.	Mathematically, it was easy for me to reply to students' questions. Via the social network as is done in the current marathon.	1 2 3 4
f.	I learned from the questions that the students raised on Facebook.	1 2 3 4
g.	I learned from other teachers' answers during the marathon.	1 2 3 4
h.	I would be happy to participate in similar marathons in the future.	1 2 3 4
i.	A Facebook marathon can be a good opportunity for teachers to learn from other teachers' approaches to solving problems.	1 2 3 4
j.	The Facebook marathon helped me learn about what questions students ask at the last minute before the exam.	1 2 3 4
k.	I enjoyed the interactions with the students on Facebook.	1 2 3 4
l.	Students contributed a lot to the workshop.	1 2 3 4

m. I would be happy for this kind of marathon to be conducted throughout the year.	1 2 3 4
n. A Facebook marathon and a private lesson may serve the same purpose.	1 2 3 4
o. I would be happy to conduct a similar Facebook marathon during the year with my own students.	1 2 3 4
p. Pupils raised high-level questions during marathon.	1 2 3 4
q. Teaching on the social network, as I did in this Facebook marathon, has been a significant experience for me.	1 2 3 4
r. The marathon on Facebook encouraged interaction between the teachers who participated in this project.	1 2 3 4

Part II — Open Questions

1. Name two things to improve a future Facebook marathon.
2. Name two things that you would not change in a future Facebook marathon.
3. Describe two interactions you remember favorably from the marathon.
4. What are your feelings on teaching through the social network following your current experience in the marathon.
5. Can you characterize the kind of questions that students bring up at the last minute before the exam? Can you list their properties?

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Building Historical Narratives about Controversial Issues on Twitter: An Analysis of Digital Literacy Levels in Secondary School Students

Delfín Ortega-Sánchez and César Barba Alonso

Abstract

This research analyses the literacy levels of a group of Spanish secondary school history students ($n = 42$) in digital environments (Twitter), with the aim of providing educational clues about the ways in which social discourses are constructed on controversial issues, in particular those generated by the Spanish Civil War. From a qualitative research approach, the most recurrent digital narrative data has been emptied and analyzed, based on three a priori categories of social analysis: gender, historical empathy and social conscience. The results report the predominance of cognitive/inferential literacy skills and, consequently, the need to incorporate new scenarios for teaching-learning history from the theoretical principles of critical pedagogy and education for active, critical and committed citizenship with social participation.

Keywords: historical education, historical accounts, controversial issues, digital literacy, Twitter

1. Introduction

Most school textbooks continue to conform to the traditional narrative provided by positivist historiography [1]. This adjustment is especially evident in the didactic treatment of controversial contents, whose stories continue to reproduce the narrative logic of a political-military discourse contrary to the purpose of education for critical citizenship and, therefore, to the development of critical literacy skills on socially alive historical issues.

Levels of literacy are conditioned by factors such as context, the individual's previous experience, language, pre-determined linguistic resources, text gender and subject matter. According to Cassany [2], reading is a transitive verb and there is no neutral or abstract reading activity, but multiple, versatile and dynamic ways of approaching understanding of each discursive genre, in each discipline of knowledge and in each human community. In this line, Ortega-Sánchez, Ibáñez and Sanz de la Cal [3], and Ortega-Sánchez, Sanz de Cal and Ibáñez [4] distinguish three levels of literacy according to the skills, abilities or competences to understand any

type of text: *literal literacy* (reading the lines): This is a reading practice in which the person is able to recover the semantic value of words and the relationships they establish within the grammatical structure; *cognitive or inferential literacy* (reading between the lines): In this reading practice, the cognitive skills of the reader allow him/her to understand the information; *critical literacy* (reading behind the lines): This level of literacy adds to the two previous ones the conception of reading as a cultural practice inserted in a specific context, allowing action and social commitment. This reading practice is based on the differentiation between facts and opinions; the assessment of the veracity of the information; the identification of the intentionality or ideology of the text; the evaluation of the reliability of the sources; the disruption in the hegemonic discourse; and the decision making for responsible social action. From this conceptual and methodological perspective, we understand school and teachers as a space and agent of social transformation [5]. Consequently, new social stories must be generated, a critical and transforming attitude towards society must be promoted and, in short, schools must be seen as democratic public spheres [6], which favor education for critical citizenship in the face of hate speech.

Studies show that young people's relationship with social networks (SN) and virtual realities is constantly increasing [7]. For this reason, it is relevant to know these relationships and, specifically, to work on critical literacy in the social science classroom. In this sense, students must be able to know, understand and relate the shared contents about the different social realities with which they interact. From a didactic point of view, SN are indeed ideal for analyzing and working on critical literacy. Among its characteristics, we find its capacity to build intra- and inter-personal identities [8], its scarce or null critical capacity of shared and/or elaborated audio-visual contents, the invisibility of subjects or people in particularly sensitive digital socialization spaces, and its contribution to the normalization of hate speech [9].

SN can be integrated into the teaching-learning processes of the social sciences as didactic resources [10, 11] and as multimodal Learning and Knowledge Technologies (LKT) [12], in order to use them to develop critical and creative thinking skills in the interpretation and social use of the textual and iconographic narratives it generates. This approach to hypertext allows us to define the social network Twitter as a complex network of interactions in which it is difficult to discern the reliability and intentions of its contents. As Cassany [2] points out, the electronic literacy goes further. It takes hypertext as the basic structure of discourse: numerous written fragments, brief, monothematic and autonomous, are connected to each other with links in the form of a network or lattice. The result is a suggestive discursive web or a dense network of roads, through which we can move at will. Ted Nelson, one of the fathers of hypertext, characterized it as 'that structure that cannot be printed' [2] (p. 192).

In this context, this research analyses the levels of literacy of a group of Spanish students of History of Secondary Education in digital environments (Twitter), with the aim of providing educational clues about the ways in which social discourses are constructed on controversial issues, in particular those generated by the Spanish Civil War.

2. Methodology

2.1 Participants

The participating sample ($n = 42$) consists of 25 boys and 17 girls students in the second year of secondary education in a private school in the city of Burgos (Spain),

aged between 17 and 19 years. The selection of the total sample was made by means of a non-probabilistic sampling for convenience, conditioned to the possibilities of access and proximity of the researchers to the participating students.

2.2 Techniques and instruments

The instruments and techniques used for the collection, emptying and analysis of data consisted of categorical tables of textual (tweets) and discursive (digital discussion groups) quotations, a teaching unit on the History of Spain (Spanish Civil War) and the digital productions of the students from the activities included in the teaching unit.

In order to organize and facilitate the resources available for the correct development of the teaching unit, a website (<https://bit.ly/2Lwx3NG>) was designed to serve as a virtual classroom. The core of its approach was the virtual cooperative learning methodology, together with the semi-autonomous work of the digital resources [13]. This methodology is aimed at the construction of knowledge through the arrangement of students in mixed and heterogeneous work groups, in order to favor the exchange of previous knowledge, skills and abilities to elaborate meanings with which to solve problems.

Discussions in digital environments have been rare or complementary in face-to-face classes [14]. The reasons for selecting this technique lay in its ability to develop competency-based learning in three interconnected areas: social, professional and academic [15]. The debate sessions were related to a socially alive issue (the Spanish Civil War) and to transversal themes such as historical memory, migrations, gender, and state models. These sessions sought to problematize curricular content on social, economic, cultural and political conflicts from coherent critical approaches, allowing students to approach them through divergent points of view, opinions and perspectives.

2.3 Design and procedure

The study belongs to the non-experimental designs of *ex post facto* research. The research is positioned in the cross-sectional qualitative methodological principles, which seek to describe the study variables on the manifest content and to make interpretative inferences about its state and relationship at a given time [16].

The data collection was carried out during the 2019/2020 academic year as part of the teaching practices of one of the researchers, included in the studies for the Master's Degree in Compulsory Secondary Education. The teaching program was sequenced in 8 telematic work sessions. On the one hand, different discussion sessions were organized on the digital productions (tweets) of the students, structured in groups of 10–12 people per session [13]. On the other hand, the elaboration of contents through Twitter was carried out by means of cooperative methodologies, in which each group, in an autonomous way, had to work with the indications provided by the teachers and their constant support in the resolution of doubts and telematic supervision. The virtual cooperative activities were directly linked to the historical theme proposed in the debates. In them, the students had to produce two publications or tweets for each activity.

The first publication had to develop historical empathy skills, through the representation of social roles (politicians with different ideologies and voters with different voting profiles) or specific professionals (group of social researchers). The effectiveness of this methodology (role-playing) has been verified in the teaching-learning processes of the social sciences by both the University Association of Teachers of Social Science Teaching (<https://bit.ly/37f8Sfe>), and by recent studies

in the area of knowledge [17, 18]. In the second publication, students were to read the historical narratives critically, based on the aspects addressed in the debate and in the proposed activity.

In this research, the results obtained in an initial activity on the beginning of the Spanish Civil War (1936–1939) are analyzed. In it, he proposed to carry out a historical reconstruction work using primary sources (<https://bit.ly/2JOyXJ9>) and to publish its results in the form of a tweet. Each group was to construct an account of the situation described in the sources provided and dated between the beginning of the Spanish Civil War and the end of 1936 in the province of La Rioja (Spain). The sources selected represented the reality of the “hot terror” in the rearguard of the summer of 1936 and the institutionalization of this terror in the autumn of 1936.

2.4 Data analysis

After a careful reading of the tweets generated by the students and their discursive interventions in the debates, we proceeded to its emptying and analysis. To do this, we used the technique of qualitative content analysis, based on the categorization and labelling of the information obtained. This categorization distinguished three levels of literacy around three structuring concepts: gender, historical empathy and social awareness.

Considering the tripartite praxis of the analysis of the discourse by Íñiguez [19] (delimitation of the social process under analysis, selection of the relevant material, and data analysis) and, in accordance with the general phases of the analysis of qualitative content and of the thematic analysis proposed by Kuckartz [20, 21] (Figure 1), we proceeded to make a deductive codification of the data linked to the theoretical dimensions corresponding to the three aprioristic categories.

The total number of codes generated was gathered in categorical families concomitant to the conceptual constructions of gender, historical empathy, and social consciousness, three thematic-structural axes widely evidenced by the

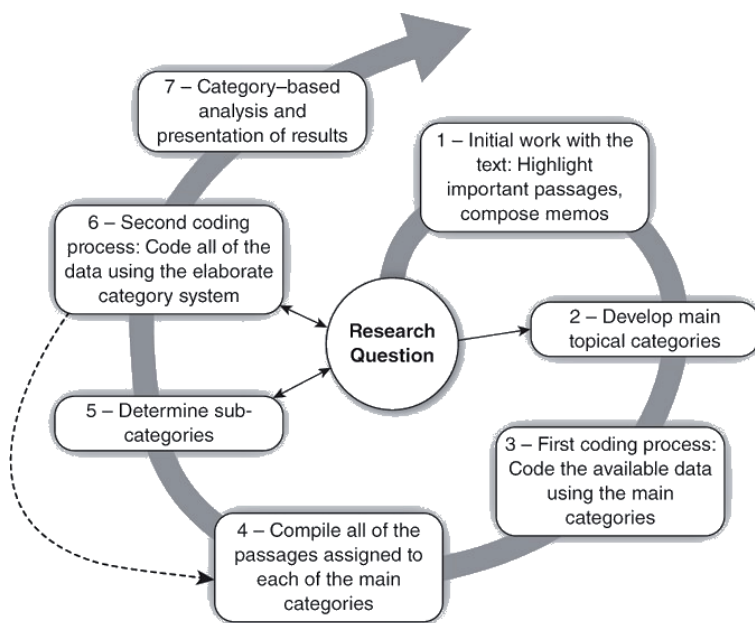


Figure 1. Thematic qualitative text analysis process. Source: Kuckartz [21]. p. 70.

scientific literature on education historically, and specifically directed to education for democratic citizenship. In a second phase of categorization, the informational contents associated with the three theoretical categories were again grouped, through constant comparison of the data [16], into one of the three levels of literacy defined and applied by Ortega-Sánchez, Ibáñez and Sanz [3], and Ortega-Sánchez, Sanz de la Cal and Ibáñez [4]: *literal literacy* (reading the lines), *cognitive or inferential literacy* (reading between the lines), and *critical literacy* (reading behind the lines). The results of the interpretation and analysis of this last categorization are those presented in this research.

The selected textual extracts presented below have been selected for its explanatory capacity of the majority category identified in the students' digital discourses (cognitive or inferential literacy). However, in order to clarify the difference applied between the levels of cognitive/inferential and critical criticality, other narrative extracts, belonging to the critical literacy category, are also included on historical episodes related to the Franco dictatorship, as a result of the implementation of the rest of the activities of the teaching program (<https://bit.ly/398ABh9>). In this sense, in order to avoid interpretative redundancies, the digital narratives associated with the literal literacy category have been omitted, since they constitute the textual bases on which the level of cognitive or inferential literacy is based, in which descriptive procedures of the social and historical reality under study are also included.

3. Results

According to the results obtained, predominance (75%) of cognitive or inferential literacy levels can be confirmed in the sample studied. Part of this sample (18%) only describes the problematic information in the three categories of analysis (gender, historical empathy and social awareness), while a minority group of students, in addition to understanding the information they are handling, is able to criticize it in order to define specific lines of social action (7%). The digital extracts presented below respond, in fact, to the reproduction and uncritical understanding of historiographic narratives ascribed to warlike-positivist approaches (cognitive or inferential literacy):

July 1936, a date in Spanish history that needs no introduction. It was the beginning of a long and bloody civil war, and the origin of a dictatorship that lasted almost forty years. (G2_S3).

In many towns in La Rioja, there were repeated celebrations of the arrival of the new regime. The participants in those celebrations could not have imagined how quickly the first conflicts would come. (G2_S15).

The alfareños put up resistance but, thanks to numerous bombings on the bullring, they were able to destroy it. The next day, after the capture of Cervera, the province of La Rioja was left in the hands of the insurgents. (G2_S4).

2000 murders whose only crime was to have different political ideas and to be part of parties opposed to the insurgents. Without trial or law or respect, they were led to mass graves without names. This is how the insurgents treated life. (G2_S18).

The stories are coherent and the spatial-temporal references are correct. However, it can be seen that there are no descriptions or interpretations after July

1936, when the Spanish Civil War broke out. Although the sources on which the story was to be built were provided through the website of the educational unit, the stories are usually built from great military milestones headed by illustrious characters. In this sense, the social invisibility of the murdered, persecuted and/or politically stigmatized women can be seen:

On July 19, 1936, at 9 a.m., the military governor of the province of Logroño, Víctor Carrasco Amilibia, proclaims the State of War. The military forces, infantry, artillery and aviation took control of the city assisted by Falangist volunteers and the first requestés arrived from the nearby villages of Navarre. (G2_S8).

General Carrasco is dismissed as military governor, civilian governor Adelardo Novo is arrested and artillery captain Emilio Bellod is appointed in his place. The mayor of Logroño, Basilio Gurrea, and, among others, the lieutenant colonel of the Guardia Civil, Manuel Fernández Valdés, are also arrested. (G2_S9).

On 21 July the García Escamez column is split. Some of the fighters went to calm down and control Alfaro, which is situated in the southern part of La Rioja. (G2_A20).

Although the activity aimed to get students to adopt historical perspectives in relation to the “death squads”, the narratives do not notice any difference between the first months of the so-called “hot terror” and the institutionalization of this terror during the autumn and winter of 1936.

However, in the following digital text, the information is correctly interpreted, taking into account the position adopted by the historical character. The tweet approaches the content with great respect, empathizing with the victims of Francoism. In the phrase “memory is not synonymous with resentment, nor is forgetting reconciliation”, the critical and transforming thought of the reality in which one lives is condensed.

In memory of Rosauero Gil Martín, a socialist militant in Burgos who was cruelly murdered by the fascists on October 20, 1936. It is suspected that his body was thrown into the mass graves of Estepar. Despite the exemplary and legitimate interest of his daughter Anastasia, his body has not yet been found. Memory is not synonymous with resentment, nor is forgetting reconciliation. In memory of you and all the victims of Franco's repression (G2_S17).

In the tweet, G2_S17 develops two fundamental aspects of historical empathy. On the one hand, the affective dimension, where we could highlight imagination, compassion or open-mindedness. On the other hand, the cognitive dimension, considering to approach the content from different perspectives, distinguishing evidence about the past or discerning between different behaviors or past and present beliefs. Consequently, the student not only understands the information on the issue, but also manages to relate this historical information to his/her political and social present.

A minority of tweets incorporate the category of gender in its social analysis. These discourses make a correct interpretation of the gender construct in the context of historical explanation, and even propose its deconstruction assuming the cultural nature of the category. As can be seen in the following tweet, in the statement “we are manipulated”, the student expresses his/her disagreement with the social hierarchization based on gender and accuses the patriarchal system of influencing our ability to make critical readings of historical knowledge.

Gender roles pigeonhole us in a preconceived thought based on our sex, manipulate us, create submissive and moderate women, and dominant and extreme men. Although it is complicated, it is necessary to blur the limit that divides us in order to find ourselves and advance in the knowledge of this warlike conflict from a non-hegemonic and non-androcentric perspective (G2_S2).

In the category of social awareness, the way in which the arrival of the new regime is legitimized stands out. Indeed, the Spanish Civil War appears in the short digital stories as an inevitable event, presented as a static war between two antagonistic sides and not as a coup d'état against the legitimately established government. Similarly, the adjective “insurgent” is used on only three occasions. Despite the fact that the use of this term increased as the didactic unit advanced, the stories usually use instead the term “national side”, thus assuming the politico-military connotations that legitimize the armed conflict.

The digital speeches also mention the murders that took place in La Rioja and, specifically, define the number of dead or missing people. This recognition is certainly anecdotal in extension and importance to other accounts. However, the types of violence unleashed by both the rebels and the Republican militias are not specified.

A clear example of critical literacy in the category social consciousness can be found in the tweet written by G2_S26:

The media has always had a lot of power and a clear local example is the influence of Méndez Pozo, who controls both the newspaper and the local and regional television to silence them (G2_S26).

In this case, the tweet connects with the activity developed within the framework of the mass media as agents of socialization and generators of opinion. The student connects the holistic vision of the media with his/her own history, through the linkage of the activity dedicated to the press during the Second Republic with the local reality of his/her most immediate environment, the city of Burgos. It alludes to one of the city's oligarchs, the businessman Méndez Pozo, and correctly analyzes the social reality lived in the city, as well as the relationship of power between businessmen and the media. It also includes the clear relationship between both spheres of power and the way they relate to society and local environment in order to maintain a tacit balance of power.

4. Discussion and conclusions

The results obtained inform the educational permanence of a traditional historiographic conception, based on the technical reproduction of conflict, on the absence of skills for the explanation and interpretation of the historicity of contemporaneity, and on the denial of the temporality and multiplicity of post-modern social narratives [22]. Historical narratives (re)produced under these conditions strengthen current power relations, and the consolidation of the positivist approach, androcentric and historical determinism.

Today, and especially since the emergence of the extreme right-wing parties, the resurgence of hate speech in the public sphere is a fact. These narratives are disseminated in social spaces to reach the young generation, and are easily (re)produced in the NS. In contrast to the political uses of history, the aim of historical education must be to promote social justice and education for critical, democratic, active and participatory citizenship [23]. From this perspective, Giroux [24] states

that learning should be based on enquiry, on the understanding that knowledge is naturally problematic. In this sense, there is ample evidence that the application of the theoretical principles of critical pedagogy helps teachers and students to act as *transformative intellectuals*.

Many studies argue for prolonged exposure and/or overexposure of digital natives to the digital tools and virtual environments of NS [7]. Over the last decade, SN have established themselves as agents of socialization, and as constructors of personal and social identities [25]. In this sense, we believe it is necessary to implement SN in teaching-learning processes [26], making visible its educational potential, and promoting the responsible use of technologies [9]. Likewise, it is necessary to work on competences, skills and abilities that are characteristic of the critical analysis of discourse in the teaching of social problems or socially alive issues, and to provide students with the tools and resources to face combat and deconstruct hate speech.

Incorporating gender and historical empathy as categories of analysis in the teaching of history would allow progress towards a more inclusive, committed and democratic social conscience. Including these categories in the teaching-learning processes, through the curricular problematisation of historical-social content or the treatment of controversial topics, would favor the development of civic and social competencies and critical literacy skills. Consequently, it is necessary to make a greater effort in the didactic transposition of contents linked to controversial issues, to avoid the generation of hate speech and to promote the construction of counter-narratives that repair and reinterpret hegemonic narratives, in order to (re) incorporate into the democratic collective memory elements that, until today, have been forgotten [27].

As opposed to rote learning, based on traditional expository-reproductive methodology, and the permanence of curricular content still attached to positivist approaches [28], the need to design, implement and evaluate strategies aimed at active learning and the promotion of socio-critical approaches in the construction of school historical knowledge seems evident. This redirection of historical education would allow students to generate their own narratives in a critical way, to develop and acquire social skills, and to understand and adopt the multiple perspectives in the interpretation of their social reality.

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Conflict of interest

The authors declare no conflict of interest.

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Research Trends in the Measurement of Entrepreneurial Education: A Bibliographic Coupling Analysis

Vanessa Pertuz and Luis Francisco Miranda

Abstract

The literature recognizes the importance of entrepreneurship for the development of students' job skills and for the socio-economic development of the countries, however, there are mixed results regarding the impact of entrepreneurial education and few validated measures for its evaluation. According to the above, we conducted a bibliometric study related to trends in the measurement of entrepreneurial education. We performed a bibliographic coupling analysis to identify the most relevant publications in this field of study. We identified eleven research trends: (1) Entrepreneurial self-efficacy. (2) Entrepreneurial intention. (3) Entrepreneurship education in higher education institutions. (4) Entrepreneurial skills. (5) Individual and national level determinants of entrepreneurial activity. (6) Drivers of entrepreneurial intention. (7) Assessment instruments of entrepreneurial education impact. (8) University entrepreneurship education program. (9) Social impact of entrepreneurship education. (10) Pedagogies used in entrepreneurship education. (11) Effectiveness of entrepreneurial education. We suggest future lines of research based on the results of our study.

Keywords: entrepreneurial education, entrepreneurship, measurement of entrepreneurial education, entrepreneurship education, entrepreneurial intention

1. Introduction

Entrepreneurship is considered one of the main strategies for economic development and competitiveness of countries [1–7]. Thus, entrepreneurs have become drivers of business growth around the world [8]. Consequently, the relationship between entrepreneurial intention and entrepreneurship education has long been addressed in literature [9]. In this regard, a growing number of research confirms that education plays an important role in promoting entrepreneurship [7, 10]. Indeed, entrepreneurial education has been gaining greater interest in literature [8] because it strengthens the entrepreneurial intention [11–14], favours the acquisition of new skills to compete in the labour market [15], develop a culture of innovation [8, 16] and influence positively entrepreneurial self-efficacy in students [17]. Thus, to promote successful entrepreneurship it is necessary to strengthen business education and the entrepreneurial ecosystem [13].

In line with the above, entrepreneurial education has positive impacts for both students and teachers [18]. Furthermore, the literature states that entrepreneurial

skills can be acquired through training [18]. In this sense, there is a growing interest in the analysis of pedagogies that facilitate entrepreneurship education in different disciplines, for example, in engineering [19], the effectiveness of design thinking is validated to teach entrepreneurial skills [19]. Also, the entrepreneurial training programs based on active learning and learner-centred approaches favour entrepreneurial intention in university students [20].

In this context, entrepreneurial orientation is a concept derived from the organizational field, which acquires more and more importance in the educational context, in fact business education is a common objective of different educational systems worldwide [18, 21]. However, despite its relevance “there is a scarcity of valid and reliable measures for assessing entrepreneurial orientation in students” [21]. Additionally, contradictory results are reported on the effectiveness of business education in recent literature [4]. In this regard, a group of authors [4, 10, 22–27] report positive effects of business training programs in different disciplines, while Khalifa and Dhiab [28] highlights business education has a very low incidence on the entrepreneurial intention of students. Indeed, according to Debarliev et al. [29] non-formal education has a more significant effect than formal education on the development of entrepreneurial intent. In accordance with the above, this article analyses trends in the measurement of entrepreneurial education using the bibliographic coupling analysis technique.

2. Methodology

2.1 Studies identification

To identify the scientific publications, we performed a search in the electronic database Scopus using the following terms combination:

“entrepreneurial education” AND “measure*”.

The search was performed on the title, summary, and keywords of the papers. The initial search yielded a total of 69 results. We included articles published since 1995 until 2020 and in English. Regarding the type of document, we only include scientific articles; editorials, conference articles, notes, and other material were excluded. Thus, after excluding publications that did not meet the requirements of year of publication, language and document type, we retained 53 papers.

2.2 Analysis of the studies

Bibliographic coupling analysis is one of the most important bibliometric techniques [30, 31]. This type of analysis allows identifying the knowledge structure of the field and its emerging topics [32]. This analysis “identifies similarities between documents regardless of citation frequency” [30]. Thus, bibliographic coupling analysis “refers to the phenomenon that two authors cite the same article(s) in articles that these two authors have published” [33]. This type of analysis was conducted with VOSviewer, a free software for bibliographic mapping.

3. Results

3.1 Descriptive analysis

Regarding the evolution of the scientific publications, **Figure 1** highlights that the first paper related to the measurement of entrepreneurial education was published in 1995. However, from the year 2017 to the year there is a significant

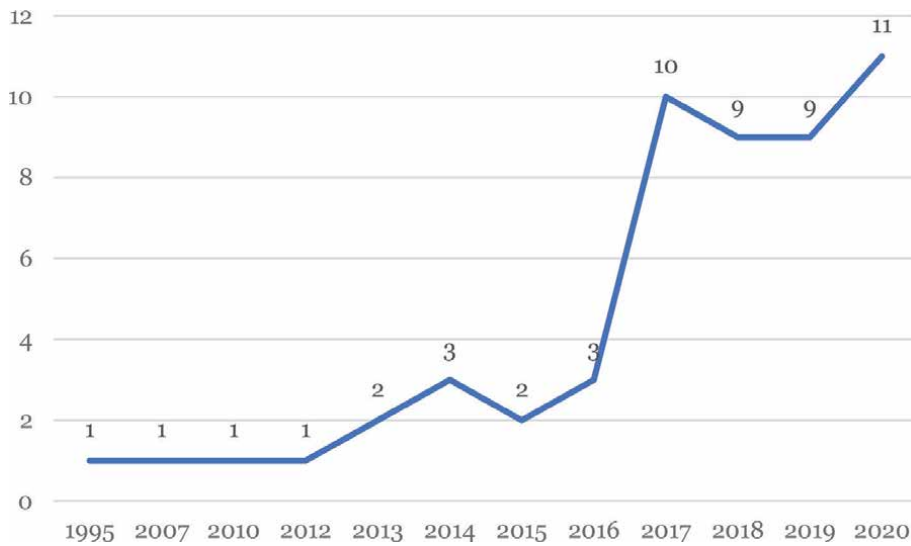


Figure 1.
Evolution of the scientific publications per year.

increase in the literature related to this topic, with a total of 39 articles, compared to 14 articles related to the search equation in the period between 1995 and 2016.

Additionally, the journals that concentrate the production related to the measurement of entrepreneurial education are: Education and Training, International Journal of Entrepreneurial Behaviour and Research, Journal of Entrepreneurship Education and International Journal of Management Education (**Table 1**).

On the other hand, **Table 2** presents the number of citations of the articles included in this analysis. Specifically, **Table 2** includes the papers with 10 or more citations in the Scopus database, corresponding to 19 of the 53 papers included in this bibliographic coupling analysis, according to the search equation presented in the methodology section.

3.2 Bibliographic coupling analysis

Figure 2 shows the thematic clusters identified from our bibliographic coupling analysis.

3.2.1 Cluster 1: entrepreneurial self-efficacy

Self-efficacy provides a measure of the impact of entrepreneurial education [41]. The first cluster groups studies related to the measurement of entrepreneurial self-efficacy, defined as motivation and capacity for the development of activities [41]. Specifically, the study by Barakat et al. [41] validates an instrument for measuring business self-efficacy, from a multidimensional perspective. For its part, the study of Cadenas et al. [22] measures entrepreneurial self-efficacy, entrepreneurial skills, civic participation, critical behaviour, technology optimism, and technology innovation in the context of the social entrepreneurship program. The paper by Gorostiaga et al. [21] analyses the relationship of self-efficacy with entrepreneurial orientation, gender, and personal initiative in vocational training students. In this context, the study by Gorostiaga et al. [21] examine the psychometric properties of the Entrepreneurial Orientation Scale (EOS). While, Mozahem and Adlouni [46] validate an instrument for measuring entrepreneurial self-efficacy, in order to determine the effectiveness of business education courses in four universities in

Journal	N° of articles	%
Education and Training	5	9,4%
International Journal of Entrepreneurial Behaviour and Research	3	5,7%
Journal of Entrepreneurship Education	3	5,7%
International Journal of Management Education	3	5,7%
Eurasia Journal of Mathematics, Science and Technology Education	2	3,8%
Journal of Small Business Management	2	3,8%

Table 1.
Leading journals in the measurement of entrepreneurial education research.

Authors	Year of publication	Citations
[26]	2010	99
[34]	2013	79
[35]	2014	59
[36]	2012	44
[37]	2007	34
[38]	2013	29
[39]	2016	27
[40]	2017	26
[41]	2014	21
[2]	2018	20
[42]	2018	18
[43]	2014	15
[24]	2017	12
[23]	2018	11
[44]	2015	11
[45]	1995	11
[25]	2018	10
[3]	2017	10
[28]	2016	10

Table 2.
Papers with the highest citations in Scopus.

Lebanon. In the case of France, the study by Laviolette et al. [36] analyse the impact of positive and negative same-gender fictional role models on students' self-efficacy and entrepreneurial intention.

On the other hand, from the context of higher education in China, the study by Jiang et al. [47] analyses the relationship between entrepreneurial self-efficacy and entrepreneurial intention with entrepreneurship education quality, highlighting that business education in this country is in a stage of exploration and growth [47]. In this regard, the study by Joensuu et al. [38] analyses the entrepreneurial intention of students from different areas of knowledge through a longitudinal study, validating that the development of entrepreneurial intention in the educational field is a complex process, which presents variations based on time and the gender of the

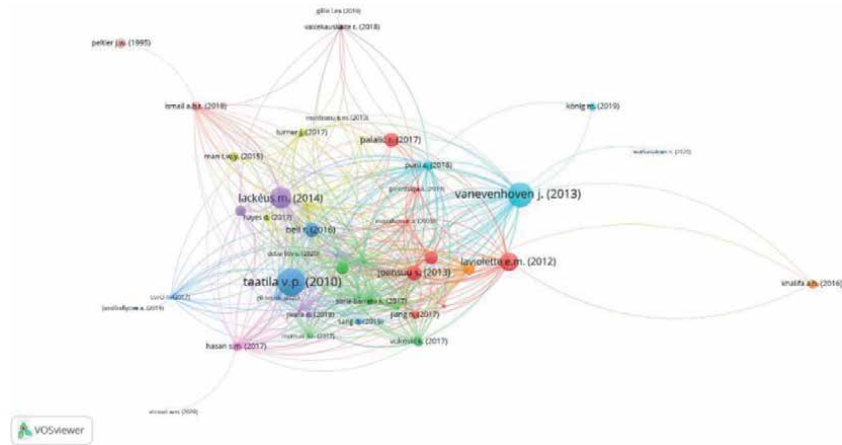


Figure 2.
Bibliographic coupling analysis.

students [38]. Thus, improving the environment and business education allows increasing the entrepreneurial intention of students [40].

3.2.2 Cluster 2: entrepreneurial intention

The second cluster identified is oriented to the measurement of entrepreneurial intention. In this regard, in the case of Malaysia, the study by Mamun et al. [1] analyses the effectiveness of public policies and programs related to business education, which is considered one of the main strategies for the economic development of nations [1]. In the context of Thailand, the study by Saengchai and Jermstittiparsert [48] analyses the link between entrepreneurship education and the entrepreneurial intention of business school students. In the case of business administration students from Chile and Colombia, the study by Soria-Barreto et al. [11] highlights that entrepreneurial education, environmental conditions and previous experience significantly index entrepreneurial intention. The paper by Wąsowska [49], developed in business students in Poland, validates the factors that influence entrepreneurial intention, including: gender, entrepreneurial role models, educational profile, entrepreneurial self-efficacy and locus of control.

For its part, the one carried out in young people from Croatia and Macedonia [3] conclude that bridging and bonding social capital could be significant enhancers of entrepreneurial intention [3]. Similarly, the study by Saiz-Alvarez et al. [50] analyses the effect of parents' gender on entrepreneurial intention in university students. Likewise, Shahverdi et al. [2] analyse barriers to social entrepreneurship from the perspective of university students in Malaysia.

3.2.3 Cluster 3: entrepreneurship education in higher education institutions

Cluster 3 groups the studies related to entrepreneurial education in the context of higher education institutions, in this regard, the study by Bell [39] analyses the attitudes and specific traits that can be linked to employability in recent graduates from higher education institutions. In the case of Italy and the countries of the European Union, the paper by Curci & Micozzi [51] identifies the incidence of characteristics such as gender and training in the formation of new companies, based on data from the Global Entrepreneurship Monitor survey. In the case of China, Sang & Lin [9] validate the relationship between entrepreneurial education, entrepreneurial alertness and entrepreneurial intention.

In the context of Senegal, Gil-Soto et al. [27] confirm that business training programs have a positive impact on the development of business attitudes of students. Along the same lines, Jussibaliyeva et al. [15] highlight that business education enables students to acquire new skills and improve their competence in the labour market. Likewise, the paper by Taatila [26] presents successful cases of entrepreneurial education in the university context, validating the importance of learning through projects to train entrepreneurs [26].

3.2.4 Cluster 4: entrepreneurial skills

In reference to entrepreneurial skills, Hayes & Richmond [52] validate whether entrepreneurial students have differentiating personality traits compared to other students, highlighting that there are clear differences in the entrepreneurial student traits [52]. Furthermore, the study by Turner and Mulholland [53] identifies students' attitudes towards entrepreneurship education, highlighting the importance of skills such as project management, creative thinking, communication skills, and confidence.

In addition, the paper by Kim et al. [7] proposes a scale to measure entrepreneurship in young people in Korea, because most scales are adapted to the adult population. Also, Man and Farquharson [44] describe the importance of team-based projects as part of business education. On the other hand, the paper by Munteanu et al. [6] is aimed at measuring the entrepreneurial character of the European Union member, from the cultural, economic and administrative component, and entrepreneurial education, while the paper by Schmidt et al. [54] validates an entrepreneurial orientation measurement scale, from a multidimensional perspective, from a sample of students from Brazil and Finland.

3.2.5 Cluster 5: individual and national level determinants of entrepreneurial activity

According to the results of this cluster, a first group of studies analyses the individual determinants of business activity. In this regard, the study by Chang et al. [43] highlights as determinants skills in reflection and self-awareness, communication, empathy and the generation of new ideas. In the case of Vietnam, the paper by Nguyen [13] identifies the following determinants for entrepreneurship: entrepreneurial education, family background, entrepreneurial ecosystem, perceived behavioural control, social valuation, perceived opportunity, attitude, entrepreneurial self-efficacy, and entrepreneurial intention. On the other hand, Lackéus [35] analyses the impact of emotional events and critical learning events on enterprising students, through longitudinal study in engineering students.

On the other hand, the study by Gimenez-Nadal et al. [14] examines the determinants of entrepreneurial activity, from the individual and national perspective, based on the results of the Global Entrepreneurship Monitor. While, Jwara and Hoque [5] describe the impact of higher education on entrepreneurial activity, highlighting that universities must integrate skills on entrepreneurship in academic activity. Similarly, the study by Khan et al. [12] analyses the role of education in business orientation in students of a business school.

3.2.6 Cluster 6: drivers of entrepreneurial intention

In the literature, different drives of business activity are identified, specifically the study by König et al. [55] analyses innovation as a determinant in the evolution patterns of business models. In the context of university students in Ghana,

the paper by Puni et al. [25] highlights that the acquisition of knowledge about entrepreneurship and the recognition of opportunities favour the entrepreneurial intention. Wathanakom et al. [8] analyse innovation as a critical factor in the entrepreneurial intention of university students. Also, the authors Vanevenhoven and Liguori [34] present the structure of a longitudinal study that measures the factors associated with entrepreneurial intention in students from 70 countries and 400 world universities.

3.2.7 Cluster 7: assessment instruments of entrepreneurial education impact

Cluster 7 groups the studies related to the challenges for measuring the impact of entrepreneurial intention on students. In this regard, the study by Huang-Saad et al. [42] highlights that there is little progress in how to measure the influence of entrepreneurial education in engineering students. In this regard, the literature highlights the need to develop assessment instruments focused on specific business results in the engineering area [42]. In the same way, it is established that currently, there is no uniform way to measure entrepreneurial intention [28].

In this sense, the study by Saptono et al. [56] highlights the need to measure entrepreneurial education from the affective domain of entrepreneurial learning, considering that most of the scales are concentrated in the cognitive and psychomotor domains. Thus, the study proposes a valid and reliable scale for this domain [56]. Additionally, in the UAE context, Khalifa and Dhiaf [28] conclude that entrepreneurial education does not have a significant impact on the development of entrepreneurial intention in students.

3.2.8 Cluster 8: university entrepreneurship education program

This cluster includes two case studies related to the impact of entrepreneurship training programs. The first of these highlights the importance of a business education program to promote the entrepreneurial mindset and innovation in the business context [16]. Through a longitudinal study, organizational factors and barriers for the development of entrepreneurship are identified [16]. The second case, through interviews, analyses the entrepreneurial intention of students and teachers, also proposes a conceptual reflection of the models used in the training of entrepreneurs [10].

3.2.9 Cluster 9: social impact of entrepreneurship education

In reference to this cluster, the study by Ahmad et al. [57] sets out the practical applications of entrepreneurship education in different countries and how it can strengthen economies and enhance community development, in the context of the Malaysian education system. Along the same lines, the study by Hasan et al. [24] validates a positive relationship between entrepreneurial education and business development. Likewise, it highlights that entrepreneurship education in the university context has a significant impact on students and society [24]. Thus, literature highlights the relationship between entrepreneurial education and economic development [24].

3.2.10 Cluster 10: pedagogical strategies used in entrepreneurship education

In reference to this cluster, the study by Ismail et al. [23] analyses the effectiveness of the different pedagogies in teaching entrepreneurship. Specifically, teacher- and student-centred learning is analysed through an experiment carried out on

university students in Malaysia [23]. Furthermore, the study by Peltier et al. [45] highlights the importance of practical experiences in developing students' skills.

3.2.11 Cluster 11: effectiveness of entrepreneurial education

The literature describes the need to study more deeply the effectiveness of entrepreneurship programs, due to the development of public and investment policies on this issue in different countries of the world [4]. In this regard, the study by Aboobake and Renjini [4] establishes that entrepreneurial education is effective in developing entrepreneurial intention in students. In the context of Macedonia, Slovenia, and Lithuania, Debarliev et al. [29] argue that non-formal business education has a more significant effect on human capital than formal education. For this purpose, two measurement tools are considered: Entrepreneurial Intention Questionnaire (EIQ) and Assessment Tools and Indicators for Entrepreneurship Education (ASTEE) [29].

4. Discussion

The literature has delved into the practical implications of business education in the university setting [24] and in the dynamics of different countries for the strengthening of the economy and the improvement of the living conditions of the communities [57]. In this way, previous studies [4, 13] highlight the importance of analysing the effectiveness of entrepreneurship programs and public policies to support entrepreneurship education.

However, despite the importance of business intention in the creation of companies, there is still no clear definition and a uniform way to measure this construct [28]. Similarly, in the field of entrepreneurial education, recent measurements have focused mainly on motivation to start new businesses [10]. In addition, the measurement of entrepreneurial intent has traditionally been carried out since the cognitive and psychomotor domains, dismissing the affective domains [56]. Also, most studies on entrepreneurial education have focused on its impact on entrepreneurial intention, using scales for potential adult entrepreneurs, which is why they are not adapted to the characteristics of youth entrepreneurship [7]. In fact, entrepreneurial behaviour assessment has evolved in terms of construct complexity and scope of empirical observation [54]. Particularly, Huang-Saad et al. [42] highlight the few advances in measuring the impact of entrepreneurial education in the field of engineering.

According to the above, Taatila [26] describe the need for higher education institutions to modify business education programs in order to improve the skills for entrepreneurship in students, taking into account the importance of business education to successfully develop innovative ideas [10]. Thus, the literature highlights the need to transform educational systems to promote creativity and innovation in students, in order to promote entrepreneurship in students [5].

Additionally, the literature highlights that the development of entrepreneurial intention is a complex process in the context of higher education [38]. This, coupled with pressure from higher education institutions to demonstrate the effectiveness of entrepreneurial education [26, 46]. Previous studies have looked at the challenges of business education and its effects on student development [22], as well as the relationship between the quality of business education and entrepreneurial intent [47]. Additionally Jiang et al. [47] suggest that the stronger the business orientation, the more significant is the relationship between the quality of business education and self-efficacy. In this sense, self-efficacy has been considered as a measure to evaluate the impact of business education [41].

5. Conclusion

The bibliographic coupling analysis describes the main trends related to the measurement of entrepreneurial education. In this regard, the literature shows different approaches related to the characteristics of entrepreneurs (Cluster 1, 2, 4 and 6), the conditions and support systems for entrepreneurship (Cluster 3, 5 and 10) and the analysis of the impact of entrepreneurial education (Cluster 7, 8, 9 and 11). These results obtained in this article have implications for teachers and educational institutions, because it presents the advances and challenges of entrepreneurial education in different educational systems around the world. In addition, for policy-makers, this article systematizes the evidence related to the results and instruments of measurement of entrepreneurial education, recognized as a strategy to favour the intention to create new enterprises and generate economic development in the countries.

We are aware that our study has important limitations. Deeper content analysis could be conducted in future studies addressing the different measurement instruments of entrepreneurial education. However, we consider that this bibliometric study provides important ideas to broaden the spectrum of knowledge regarding trends in the measurement of entrepreneurial education.

According to the analysis carried out, entrepreneurial education is approached from different perspectives in the literature, from self-efficacy and the development of entrepreneurial skills, to pedagogical strategies and the social impact generated by entrepreneurship in different contexts. Most of the literature focuses on the measurement of entrepreneurship skills in students, however, there is very little literature related to the competencies of the teacher who trains entrepreneurs. We suggest that this aspect be developed in future research.

Similarly, in line with the results of Ismail et al. [23], we propose the development of future works from a quasi-experimental design, because it allows to better address the impact of entrepreneurial education [23]. Furthermore, we suggest developing measurement instruments or methodologies to allow evaluating the impact of entrepreneurial education from different perspectives. Finally, it is important to delve into the effectiveness of business education, due to the contradictory results offered by the current literature [4].

Conflict of interest

The authors declare no conflict of interest.

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Male Educator Recruitment in Early Childhood Centres: Implications for Teacher Education

Joyce Mathwasa and Lwazi Sibanda

Abstract

The absent male educators in the Early Childhood Development (ECD) programmes have created a gap in the momentum of success gained through fathers' involvement in the early life of children. Worldwide, the gender imbalance trends in early childhood education and lower primary classes have been immemorial female skewed with men becoming extinct in the arena. Hitherto, copious studies testify of men's involvement as fathers in young children's early life as crucial for their social, emotional, and cognitive development. This chapter focuses on the importance of having male educators in the foundation phase of children's care and learning, barriers to male involvement as educators in early care and learning centres, and how learning institutions can recruit and train male educators specific for the ECD. Male educators in the ECD have been confronted by stigmatisation, ridiculed, hit glass ceilings, and are viewed with hostility and suspicion. A preliminary exploration of literature from renowned published work that focuses extensively on various countries across continents will be covered in this review. This chapter envisaged strategies that could be employed in the recruitment, retention, and active participation of male educators in the ECD settings that will inform policy and teacher education.

Keywords: elementary education, gender bias, male disempowerment, perceptions Recruitment and Retention

1. Introduction: early childhood development setting globally

There are various terminologies used to define Early Childhood Development (ECD) by different institutions for the diverse programmes. Commonly used early childhood terminologies are: "Early Childhood Education (ECE), Early Childhood Care and Education (ECCE), Early Childhood Care (ECC), Early Childhood Care and Development (ECCD), and Early Childhood Care for Development and Early Childhood Development (ECD)" [1–3]. Worldwide, early childhood is identified as a period that "covers the prenatal phase to eight years of age and it is during this crucial stage that the brain develops immensely throughout the lifespan" [4]. It is in this period that the child needs extreme attention and appropriate care as it is the most critical time for the growth and development. According to the United Nations Convention on the Rights of the Child Article 6 (Article 6, UNICEF) every child has a right to early childhood development, highlighting "a right to live...and develop

healthy” and that every child has “the right to a standard of living that is good enough to meet their physical and mental needs” (Article 27, UNICEF). Reiterating the importance of childcare, the World Bank [5] states that children who access adequate care and stimulation early in life are likely to be more successful later in life, and children with a healthy weight and physical development are more likely to develop normally.

In several European and North American countries, Early Childhood Education and Care (ECEC) has become the standard where most children from birth and upwards attend a regulated early education service due to the entrance of women into the corporate world. Additionally, early childhood services are characterised by much more than a drop-off location for working parents, but more importantly as a place where the child is given the chance to engage and develop in an array of educational and social activities. Extensive research has proved that early education has positive influence on school readiness thereby increasing the number of children in formal ECEC. There has been an increase in the demand for formal educative childcare since more mothers became career women and even the stay-at-home mothers need childcare service at some time to help their children develop social skills.

2. Men in early childhood development settings

For ages worldwide women have dominated in the area of Early Childhood Development and Care (ECEC). This has been due to public confidence in women as they have been considered to be more nurturing than men, which has also become a hindrance to men who anticipate pursuing careers in early childhood education [6–9]. Recently, studies in Trinidad and Tobago have exposed female dominance in the teaching profession where males constitute roughly a quarter of the teaching fraternity [10, 11]. It is worse in the ECD where male teachers are almost extinct. Similar statistics in Australia reveal that there is approximately two percent males in the entire early childhood profession [12].

Gender imbalance among the early childhood education personnel has been found to be a global phenomenon where extensive research confirms that the percentage of male early childhood educators lingered around 1–3% in the majority of countries in the West [13]. Xu & Waniganayake [14] also found scarcity of men in ECE in non-Western countries like China, where only 2% of ECE teachers are males. There is no difference in the Philippines where women outnumbered men as ECE teachers. Historically, childcare in most homes has been seen as a woman’s work, hence, the trend has spilt over to early childhood education making the female workforce to dominate. The long-standing perception from the society in those countries has been that women are more nurturing preventing men to equally participate in early childhood teaching profession [15]. Reviewing literature on early childhood teaching one finds scanty research on men as educators and in the studies that ventured into the subject mainly focus on the negative aspects of men’s choice in this career. A study by Jordan [16] revealed that while some men got support from fellow teachers, acquaintances, and family members to pursue careers in ECE, a good number of surveys described fears and challenges that men faced in the profession.

In the 1970s, Sweden introduced gender equality in the teaching arena and extended the public childcare resulting in the increased demand for well-educated pre-school teachers. Promotion of male recruitment started in 1971 as a form of positive discrimination to attract men to join pre-school teacher education. This initiative saw a ten percent increase in the number of men becoming pre-school teachers by 1975 [17]. However, the trend was that most men held managerial

positions which made the unions unhappy because the initial idea of male recruitment was to introduce male to hands on childcare through interaction with children and to have male role models in the pre-school classrooms.

Qin & Wang [18] observed how several governments worldwide had introduced broad reforms for ECE since 2010, whereby they increased financial input, launched political authorities who supported teacher training programmes. The teacher professional development policy is one of the reforms that has been extensively deemed to be the crucial element in promoting the quality of ECE. According to Kent [19] in this policy, teachers were considered as facilitators for educational reform and the custodians of sustainable development in schools [20].

Notwithstanding the desire to join the early childhood profession, male personnel in early childhood provision face hostile public perception who assume that men are more likely to abuse children more than their female counterparts [9, 21, 22]. There seem to be double standards when dealing with men. They are most valued as fathers, brothers, uncles, and grandfathers in homes and in the community but viewed with suspicion in early childhood settings. Men have been accepted in junior and senior sectors of education, yet their involvement with younger children invites scrutiny and scepticism.

The importance of ECE is that young children develop their gender identity [23] and realise the important role all genders play in their care and education. The traditional gender stereotypes are reinforced when young children do not relate with male teachers and caregivers who are responsible for their growth, learning and socialisation [24, 25]. The growth and development of children is incomplete if they do not experience a comparable range of models of masculinity and knowing what it means to be a boy or a man [26]. Early childhood is a critical time in their gender identity development, hence, the need for a gender balanced workforce to provide children with a richer variety of role models [27].

3. Theoretical framework

There are two fundamental discourses or policy narratives that have been the major concerns about the scarcity of male teachers in early childhood settings, which are: (i) the need for more male role models to fill the gap of absent fathers and the cumulative incidence of single-parent families [28–31] and (ii) the desire for more gender balanced representation in the teaching profession, a position that is often underlined by limited philosophies of equity which have failed to consider the importance of the status of women's work, racial inequality and the privilege of males [4, 27, 28, 32–35]. Male teacher shortage has dominated policy narratives particularly in trying to understand the policy physique of boys' education in which concerns of female dominance have been inextricably linked to the phenomenon 'failing boys' in need of male role models [36, 37]. Due to debates about gender balance in teaching, Riddell and Tett [35] have described these tensions as modernist and post-structuralist accounts of sex and gender where 'man' and 'woman' are socially categorised and increasing the numbers of male teachers so as to have a more gender balanced representation in the teaching profession has been problematic. However, policy initiatives that have simply engaged more males in teaching have not adequately addressed the politics of gender and race, hence, the deflation and rejection of teaching as women's work in early childhood continues to sideline males [38]. Masculinity and femininity tensions have drawn debates where scholars argue in a dissociating of sex and gender have created a divide between policymakers who deny that the sex of the teacher is irrelevant, and academics who think that gender may not affect performance of a person and suspicious parents who have lost

trust of men in the early years teaching [35]. Such debates, however, clearly highlight the need for further reflection on the against-epistemic concerns central to both policymaking and the theoretical frameworks that inform empirical research in the field of gender in early childhood education [39].

The issue of male absence in early childhood environments can be understood through various theoretical frameworks. The Social Role theory is one of the lenses which classifies men and women in terms of the customary division of labour where expected the responsibilities of men are frequently done outside the home while women presume their responsibilities involve managing homes [40]. The differences in gender propose that most behavioural disparities which are attributed to males and females are expectations of social roles which are governed by the cultural stereotypes [40, 41]. The social behaviour of males and females has been affected by the expectancies of stereotypes regarding gender such that they have acquired different qualities through this process of socialisation [41]. Explaining the theory, Halpern [42], suggests that the innate physical disparities between men and women pervaded the historical division of labour in the society. These particular gender roles correlate with perceived differences in cultures and societies; consequently, women are deemed as primary caregivers for children and nurturers in homes while men operate as breadwinners in families. Similar to this line of thinking is Coleman's [43] social capital and how it takes priority over the social role. These expectations that emerged due to the natural differences between males and females have caused gender stereotypes or gender categorising making them male-specific and female-dominated careers [40] such as nursing and teaching professions where women mostly outnumber males while men also tend to dominate in construction and engineering. The assumption in Eagly's theory is that women are better nurturers than men hence, they dominate in the ECD due to gender-specific careers cultivated from inborn competences. Worldwide there is a strong belief that gendered cognitive schemas encourage the projected roles of females and males. Subsequently, the social role theory explains the existence of a wide range of stereotypes and illustrates that men are capable of learning to perform certain roles and permeate in exclusively female domains [41]. Notwithstanding early socialisation, the social role theory proposes that men can acquire new skills and behaviours related with the provider role by involving themselves in social experiences that were once reserved for women.

Comprehensive sociological theories concerning gender lead us to Bem's [44] early theory of gender schema which she later modified to be the enculturated-lens theory (1993) used in gender related research. Bem's theories [44, 45] accentuate on the cultural learning of gender and specifically featuring the social and historical perspectives as 'lenses' for gender socialisation. In essence, human beings are socialised by various agents within the society (namely parents, school, and the media) leading to schemas also known as internal cognitive networks about masculinity and femininity which assist both to shape and guide the views of individuals. Bem [45] further explains the process leading to the schemas as follows:

- “the established pre-programming of the person's daily experience into the default decisions, or the traditionally pre-cut ‘channels,’ for that specific time and place which differ distinctly for men and women”
- “the transmission of unspoken lessons – or meta-messages – about what lenses the culture uses to organise social reality, including the notion that the dissimilarity between male and female, masculine and feminine, is extremely important”.

That then leads people within the society to view themselves and the world they reside in through a gendered 'lens', that influences their thinking and actions. Watson, Wright, & Groenewald, [46] postulate that these social norms which precisely ascribe the roles and expectations of men and women that are deemed appropriate or desirable by the society are frequently resistant to change. The cycle of these perceptions on gender positions persists through generations.

4. Importance of male educators

The importance of have male educators in ECD has gathered momentum kindling the interest of researchers and policy makers in the recent years due to the consistent concerns such as 1) the none-participation of men as fathers in their children's lives, 2) the dearth of men in the early childhood settings, 3) the cognisance of the worth of father involvement in Early Childhood Care and Education and 4) the significance of men as role models for their children, particularly boys. Plentiful research testify to men's involvement as fathers in the early lives of young children as essential for their social, emotional, and cognitive development [47, 48]. There is no corresponding prominence on men as educators of young children, yet it is essential that every child gets influence from both female and male educators to maximise social, emotional, and academic development.

Notwithstanding changing perceptions that men are also needed in the sector, the ECEC profession in worldwide is still dominated by women. Since 2010, countries like China have realised the importance and increased their interests in ECEC prioritising the development of ECEC [8] and encouraging men to join the ECEC workforce as a means of improving the quality of ECEC. The biggest argument in many nations is that as role models and father figures male teachers contribute to all round growth and development of younger children. Jensen [49] presenting his argument insisted that male teachers are good at detecting and resolving boy related issues at school than female teachers because they understand the perspectives and experiences of boys based on their own lived experience. With the help of male teachers, boys are able to explore their own interest.

There has been worldwide discourse concerning the benefits of having men in the early childhood education and care, and three main aspects are highlighted:

- Engaging more men into the ECEC arena will bring gender equality in the society. Cameron and Moss [50] observed that the presence or the absence of male teachers in early childhood services contributes to or challenges dominant beliefs about gender roles and relationships in society. A mixed gender workforce in a centre forms part of a gender equity debates about men and women sharing childcare equally, in as much as a centre with only women workers is part of a very different arguments which classifies women an acutely suited to caring for young children.
- The benefit of having more male teachers in the early childhood education profession is the creation of a diverse working dynamic in centres thereby raising the status of teachers.
- Male presence in ECEC provide a male role model for children, especially for those who come from a single-parent family or have parents working long hours. A male teacher compensates for father absence in families [49]. The role played by male teachers in the lives of children cannot be downplayed as some families rely on their support to discipline children especially boys and be their role models.

5. Barriers or glass ceiling to male educator recruitment and retention

The absence of fathers' involvement in the early life of children has propelled the desire for male figures and male support in the early childhood programmes. Worldwide gender imbalance has been noted in the early childhood education and lower primary where classes have been female skewed with conspicuous absence of men in the arena [51–53]. Most of the studies in Netherlands found that eighty-five percent of primary teachers are female with the United Kingdom (UK) showing the similar trend of eighty-six percent female and Denmark had a slightly lower figure of seventy-six percent female teachers in the primary schools [54]. Mashiya [55] and Koch and Farquhar [56] found the number of men in early childhood setting as low as ten percent in Finland, only four percent in Germany, and the United States had only two percent. Studies also found that glitches resulting from gender prejudice, gender stereotyping and numerous systemic challenges lead to the failure of South Africa to attract male teachers in pre-schools [46, 57]. Teaching in pre-school is not a lucrative career choice for men hence, they shun it.

Worldwide there is social stigma against men who venture into early childhood teaching with most of them being labelled 'abnormal' [58], making a career as an EC teacher an unattractive option for men. Male educators often face scrutiny and suspicion when they attempt to express affection for young children thereby putting their livelihoods and reputes in jeopardy. Chen, [59] found that men in China face social stigma when they venture into working with young children as they are viewed as main breadwinners and being paid low salaries prevents them from considering the ECEC sector as a career choice [60, 61]. Existing early childhood teacher programmes are viewed by most scholars as inappropriate for men [59, 62] due to some mandatory modules such as dancing, music, and painting which men perceived to be challenging because of their genetic characteristics. Similar sentiments were expressed by Jing [62] who cautioned that most of the training environment are female-dominated and are likely to be highly 'feminised' with a more female students and staff making male trainees uncomfortable. Most studies have found that public distrust and constant community scrutiny are strong pull away factors that drive men from teaching young children with the remnants in the profession are those who drift to administrative positions escaping public antagonism [21, 63, 64]. Observing the situation of male educators in the early childhood Sanders [65] noticed that they constantly have to justify their career choice to family members, friends, and their female counterparts. The larger part of society perceive that men are less careful and patient with young children and should be allotted to carry out more educational tasks and less caring assignments [66–68].

The status of teaching in early childhood education has remained low hence most men cite that as a barrier to them venturing into that profession. Aggravating the situation is the misconception that teaching in the early childhood education entails one to possess marginal skills and proficiencies [21]. Some scholars like Cohen [69] and Cooney and Bittner [70] collaborate that the low status of ECE could be the reason why personnel working in that field are paid low salaries instigating many male teachers trained in ECE to move into higher status and higher paying positions in school administration or higher education. Besides low salaries, several studies have found other underlying reasons such as fear of child abuse allegations, lacking social status as the origins for the scarcity of men in ECEC field [71–73]. The need for male influence in the lives of the young generation requires concerted societal efforts to entice men in the field of ECEC.

6. Methodology

Research methodology is the path through which researchers need to conduct their research. This chapter adopted desk-based research also known as the systematic inquiry which relied on empirical researched secondary data which was gathered without fieldwork. Ideally, these published reports and statistics are certainly important sources [74]. In the context of this chapter the term is widened to include all sources of information such as reputable journals, books and different published articles that do not involve a field survey. As depicted by name desk-research is a technique which is mainly acquired by sitting at a desk and collecting data from existing resources hence it is often considered a low-cost and effective technique as compared to field research. Still, for the researcher to save money and time they must have the proper knowledge that can be used as benchmark of the research procedure. Besides being time and financially economic there is reduced bias and infringement of ethics as there is no human contact in collecting data. The other advantage was that the researchers were able access information related to the phenomenon from a wider international community. However, the technique also has limitations such as lack of the ability to verify on the reported facts, stringent restrictions on the access of some publication that have relevant information.

7. Results

7.1 Benefits of male involvement in ECE

Men in families and the society at large are valued as breadwinners, protectors and disciplinarians who instil values and morals to their offspring. With this background several studies have sought the significance of male educator in pre-school. It turns out that in South Africa, men are rare in early childhood setting even though they would be valued as role models who would provide discipline for children. Educators' views were *"Having father figures in the foundation phase would provide male role model seeing that many children do not have fathers at home, and it would be good for discipline and the values because the foundation is important. Male educators can handle discipline better and they are good in handling sporting teams and children listen to them hence, they perform better in school."* Similar sentiments coming from parents were *"Men in education are not as valued as fathers are in families, there has to be a mind-set shift with people viewing the presence of men positively so that they continue that family stability, discipline and performance will improve. Participants in a study in China advanced that "Male participation in ECEC balances the gender ratio, moderates the environments, assists with the construction of children's masculinities and promotes quality education through."*

7.2 Culture and stereotype mind-set

Even though the presence of men in children's early education is important, culture and stereotype mind-sets prevent men from venturing into ECE as educators in the Eastern Cape elaborated that: *"People think that men are not suitable to handle early childhood teaching but ought to start at middle school. Men do not have that motherly love and patience with very young children as pre-school demands hands-on people."* Similar sentiments were expressed in Nigeria were that Men in ECE are *ridiculed by other men who regards them as if they are stupid.... men are shy and do not like to be humiliated."* Participants in a study in Zimbabwe posit that there was *a need for men to change their mindset, as some children who need their firm hands.*

Concurring was a study in Kenya where participant lamented that: *“Men were not accepted as educators of young children because of the negative stereotype belief that men are strict, harsh, impatient and can abuse children.”* Negative mind-set and stereotype attitude towards male educators deter men from venturing into female dominated teaching arena.

7.3 Fears, challenges and stereotypes

Whereas men play a pivotal role in nurturing young children, there is so much mistrust of men around children in pre-school centres from the society. Some participants expressed that: *“As a mother, I fear that male teachers may be too strict, small children are too subtle to be taught by men who are likely to touch children inappropriately and sexually abuse them and when their temper flares up, they may be aggressive and physically abuse children.... there is so much violence against women and girls.”* While research has proven that men bring stability in families, children behave and perform better but there are families with men physically present but have the worst maladjusted children more than those from single mothers. Some men can be very abusive to their families. Yes, they may be financially better but there are some men who do not really care for their families even if they can afford.” Some deep-rooted fear and mistrust of men was conveyed: *“I would not be comfortable with a male educator in the pre-school because men can be cruel and abusive as fathers or educators. I was traumatised by men in my family hence I had this child. Besides, children in the pre-school need toilet training, some changing of diapers which most men, especially African men are not socialised to do.”* Likewise, one participant said *“Men are so unpredictable because some are good, but others are very cruel.....I was raped by men I looked up to for protection when I was seven years.... So, I am sceptical about men in a class with very young children.”* A male participant voiced that *“Nowadays men are prone to alcohol and substance abuse so for men to teach very young children they have to be of sober habits.”* The sentiments expressed reveal general lack of trust and deep-rooted fear of men as educators of very young children although men are valued as fathers. The deep-rooted fear and mistrust of men is due to the high crime rate among women and children in South Africa with men equally not trusting other men with their children. In Turkey, a parent expressed her desire of having a male teacher for her child, but I could not ignore the concerns she had about Child abuse which affects as boys and girls.

7.4 Gender ascribed role

Eagly's Social Role theory suggests that nurturing of children is a role that is generally ascribed to women. Participants who conform to this theory attest that: *“In my culture man understand that they are breadwinners while nurturing of the child is a mother's duty. It never crossed my mind that when a man is teaching in the pre-school it's a job that sustains his family, however, I do accept that the children need male influence from early childhood. In caring for young children there is a lot of touching, hugging, wiping of this and that so we think that men do not have that kind of affection and patience. Generally, people think that men do not have the compassion to deal with little children because sometimes they do not show the emotion of love. Men are too stringent, and this can scare the little children. Its been for ages women dominating in this sector such that people just don't trust the men in ECD, maybe it is just the negative attitude or thinking about men. A young man lamented that he has been quizzed, viewed with suspicion ... but he advanced that, you see... the fact is that I love children, I have children of my own does not count to the society, and they just view us men with suspicion “My challenge has been to justify my motive to teach in the ECD mostly to my friends. It has taken some time for my colleagues to fully accept me. At times you can feel their suspicionit is*

like they are keeping a watchful eye on a prisoner at a distance... but I asked them why female teachers in high schools are never questioned of their motives.” Data from different countries indicates that socialisation of men and women is inherent on ascribed gender roles.

8. Discussion

In this discourse men have generally been viewed as playing a significant role as fathers confirming literature in several studies which found that the involvement of men as fathers is valued as disciplinarians, teachers of values and moral and bread-winners, gender-role models, and nurturants [75, 76]. Collaborating this study is abundant research globally that attest to the involvement of fathers as essential for their social, emotional, and cognitive development [48, 56] in the early lives of young children. The importance of men as fathers is not a subject for debate as there is a mounting body of evidence indicating that fathers play a critical role in their child’s mental and physical health development [77] increased sociability with later school success [78].

Although men bring up children in homes as their offspring when they turn up in educational setup, culture and stereotype mindset of people doubt their capability to nurture and educate children. In this chapter male educators have been recognised as pivotal in building up well-adjusted children behaviourally, yet cultural attitudes and stereotype judgments, and prejudices deter them from the teaching of young children [52, 79]. Besides being rejected by fellow female colleagues male educators face resistance from the communities they serve as confirmed by some studies [48, 80] which found that discrimination, marginalisation and the prevalence of gender inequality against male educators in pre-school was very high in many worldwide countries.

This study found deep-rooted fear of men from all sectors including other men. Men have been known to be strict which may scare young children confirming the prevalent belief in societies that men are not capable of caring for and educating young children like women [81]. There was widespread fear that men can abuse children in this study which has turned out to be a worldwide concern in early childhood settings. Collaborating these findings is the study are the claims by school heads who purposely avoid engaging male teachers as child protection measures because of the increase because of the increase of paedophilic abuse [82]. Parents claim that the safety and comfort of their children is paramount as it gives them peace of mind when they leave children in the care of schools and centres. However, there is no research that has authenticated abuse in schools as most of the abuse happens in homes from family members or close associates to families.

The findings in this study show that men simply avoid teaching in the early childhood setting due to gender ascribed roles, This conclusion is associated to social role theory of gender in which according to Eagly [40] most behavioural discrepancies which are attributed to males and females were as a result of cultural stereotypes regarding gender. The way males and females believed and acted was emanating from the social roles being instilled to people from a tender age.

9. Strategies for male educator recruitment

Research studies have revealed that there are more female ECD educators in the teaching profession as compared to their male counterparts. However,

the majority of the arguments for gender inequality among ECD educators stress that the teaching profession has become increasingly 'feminised' thus the education of male learners has suffered because of the resultant lack of models [83]. The main hurdle to men becoming early childhood educators is the prevalent belief in societies and in the teaching profession that men are not capable of caring for and educating young children than are women [81]. Hence, to counter such belief, there is need to devise comprehensive recruitment strategies where all education stakeholders have a role to play in enticing more male ECD educators to take up the profession. These stakeholders include administrators, teacher educators, career counsellors, and the ECD teachers themselves [81].

Mills, Martino and Lingard [83] point out that the Education Queensland's Male Teachers' Strategy indicates the need for more male educators to promote diversity within the education system. Thus, the following strategies as stated in Mills et al. [83] have been suggested,

- increasing the numbers of males applying for teaching positions;
- enhancing employer of choice status for males wishing to enter teaching as a career;
- increasing the representation of male teachers;
- increasing the job satisfaction level of male teachers, and
- improving working conditions and establishing a culture that values and acknowledges the needs of male teachers.

In addition, Cunningham and Watson [81] advise that each institution's policy, vision, or mission statement on staff diversity should include as a goal on active recruitment of men. Staff development sessions on gender issues in the workplace can encourage all staff to put aside their preconceived notions about the roles of teachers of different genders. Recruitment of volunteers from high schools, colleges, and universities is another strategy which could help in involving men in the ECD classroom. For instance, students in education, psychology, child development, family life, and occupational education are often required to complete service learning, community service, career exploration, or volunteer hours, these can be engaged in ECD centres and might consider teaching as a career because of rewarding experiences working with young children. Teacher educators should be actively involved in recruiting male ECD teachers through providing information on the early childhood field to career counsellors and guidance personnel. Accordingly, effective recruitment materials which depict men as ECD teachers and use of language that specifically speaks to men and addressing their questions and concerns would be fruitful. More so, ECD teachers should make ECD learners aware that males can be teachers by using language free of gender bias and by selecting, displaying, and reading children's books that show men as fathers, nurturers, and teachers [81].

Patrick [84] further reveals that to address the problem of shortage of male ECD educators, some countries such as the United Kingdom embarked on gender-specific recruitment for those positions and also offered monetary incentives. Consequently, through this incentive and efforts of recruitment, the United Kingdom had seen a steady increase in the number of male teachers in primary grades.

10. Conclusion

This chapter illuminated the significance of recruiting male educators to actively participate in nurturing, caring and teaching children at Early Childhood Development level. The global perspective of recruitment of male ECD educators and their participation has been highlighted in this chapter. Issues regarding barriers to male involvement as educators in early care and learning centres, and strategies on how learning institutions can recruit and train male educators specific for ECD level have been addressed. It is anticipated that the contributions of this chapter will inform policy makers, teacher education institutions and other stakeholders.

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Living Heritage Educational Experiences in a Pandemic Scenario. The Case Study of the Ethnomedicine Museum A. Scarpa

Anna Siri

Abstract

Heritage is inherently communicative; it is designed to transmit and represent. As stated by UNESCO, living heritage is fundamental because it provides communities and individuals with a sense of identity and continuity. It can help promote social cohesion, respect for cultural diversity and human creativity, as well as help communities build resilient, peaceful and inclusive societies. Ensuring that cultural heritage fulfils the function for which it was conceived and generated, even in the case of closures forced by health emergencies, means enhancing it, giving it the possibility to continue transmitting culture. In the current COVID-19 global pandemic scenario, we are helped by the many educational strategies available today thanks to science and technology that enable people of all ages to learn continuously, anytime, anywhere and in a variety of situations combining formal, non-formal and informal learning. The current scenario has forced a redesign of the way citizens, and especially students, access their formal education. This contribution aims to highlight the importance of using the self-determined approach for training and proposes a blended learning model (formal in virtual classrooms and informal in a museum) for intercultural education of health professionals. A model which can be reproduced in continuing education and which represents an innovative way of experiencing heritage in any situation.

Keywords: anthropology of health, scientific and cultural heritage, heutagogy, education, healthcare students, intercultural dialogue

1. Introduction

The impact of COVID-19 pandemic on the educational and cultural sector is being felt around the world. This impact is social, economic and political – it affects the fundamental right of access to education and to culture, the social rights, and the protection of the diversity of cultural expressions. The unfolding crisis risks deepening inequalities and rendering communities vulnerable.

The crisis has, on the other hand, accelerated the digitization and online consumption of educational and cultural content, creating new and unprecedented challenges for the diversity of cultural expressions. As decisions taken now are likely to shape our world for years to come, it is imperative to be strategic in creating

educational models able to encounter the demand for skills and knowledges of the emerging society.

In the 21st century, the model of education that assumes a curriculum with pre-determined outcomes, written by a subject matter expert or instructional designer, is working less and less well as traditional ways of learning evolve and technology facilitates access to and use of information. The next generation of workers will increasingly need an approach to learning that supports self-determined processes and outcomes. Formal education will always have a role to play in the development of knowledge and skills, but it will be increasingly complemented, and perhaps even pushed off centre stage, by the attractiveness of new media and the ever-lower costs of new technologies.

In this article I present two closely related concepts that can offer a pathway to effective learning and try to link them to our history and our cultural and scientific assets that cannot and should not be left behind in this knowledge revolution.

The first concept addressed is the transformation of learning from being structured by others and pre-packaged to becoming more and more self-determined (heutagogy learning strategy).

This involves an important reflection on the fact that everyone who has access to the Internet today has, in practice, already adopted heutagogy as a fundamental part of their personal learning strategy. Before the Internet, anyone who had access to a library or a newspaper, for example, did the same thing. Heutagogy is a word itself that is new, but it describes a very old learning strategy.

Heutagogy is a kind of complement to pedagogy and andragogy; the key difference is that heutagogy is self-determined strategy and teachers or educators are not necessarily involved, unless learners choose to engage them at some point.

In this context, the importance of exploring the concepts of personalised and individualised learning, as well as their differences becomes evident. The difference between the two concepts should be clear in our school environments because it is strategic for the success of each individual even after the experience of formal education within the school.

The second theme addressed is the importance of culture as a key factor for inclusive growth and sustainable development of our society. Hence the importance of conveying culture through the tangible and intangible assets we possess, and which must continue to be part of our education and our lives even in this technological age, providing for adaptation to new learning approaches.

2. Heutagogy (or self-determined learning) within education

Lifelong learning is the starting point from which to begin rethinking the model, starting precisely with those structural changes that affect both social and educational and training systems, globalisation that stimulates new and increasingly personalised opportunities, and the labour market that requires fewer and fewer low-skilled activities and more and more complex skills [1–4].

Training policies are called upon to enhance the possibilities, aspirations, motivations and situations in which people are in a position to learn in a continuum of all phases and situations of life. This perspective brings into play new actors, new ways of acting and new sources of resources to draw on for the design and qualification of lifelong learning.

It is not enough to qualify an education policy as a simple extension of traditional education into adulthood, but it becomes a priority to promote a new approach to address the need for solutions to many unprecedented challenges in the cultural, social and professional life of modern societies.

	Pedagogy	Andragogy	Heutagogy
Learner Dependence	Dependent	Independent	Interdependent
Learning Resources	Teacher-driven and controlled	Learner and teacher controlled	Teacher and learner provided
Learning Reasons	Gaining next level	Increasing performance	Learning potential unplanned, non-linear
Learning Focus	Subject-centred	Problem-centred	Problem-oriented
Motivation	External motivation	Internal motivation	Self-efficacy driven
Teaching Role	Process-designer director	Collaborator	Capability-builder

Figure 1. The difference between pedagogy, andragogy and Heutagogy. Source: Adapted from Kenyon & Hase (2001).

The primary objective therefore becomes the creation of conditions that allow each individual to fully develop his or her potential, contributing in a conscious way to the development of society as a whole.

This learning process, linked to a new vision of human development, qualifies the pedagogical meaning of adult education as a “progression from pedagogy to andragogy to self-regulation, with learners likewise progressing in maturity and autonomy” (Figure 1) [5]. The shift from andragogy to heutagogy expands the self-directed learning practices of andragogy and requires learners to take an active role in developing their own learning skills to meet their needs [6].

Heutagogy or self-determined learning can be considered a natural progression or a readjustment of previous theories to better match the emerging needs of a global society and the digital age. Heutagogy is a term that originated in the 1990s with Stewart Hase and Chris Kenyon at Southern Cross University in Australia. According to Hase and Kenyon, “Heutagogy looks to the future in which knowing how to learn will be a fundamental skill given the pace of innovation and the changing structure of communities and workplaces.” [7].

Theories such as the humanistic focused on the growth potential of healthy individuals [8–9], the constructivism emphasised the collaborative nature of learning [10], the reflective practice placed at the core of professional knowledge and learning [11–13], the double-loop learning leading to more effective decision-making and better acceptance of failures and mistakes [14–15], the self-directed learning [16–17], transformative learning focused on adult education and adult learning [18], the capability approach [19–20] and self-efficacy [21] are some of the theories that have contributed to the development of heutagogy.

It is learner-centred as opposed to teacher-centred learning. Learner chooses the learning path by reflecting on his or her own strengths and weaknesses and exploring new strategies that suit his or her learning style. This process of self-reflection allows for double loop learning, where the learner is enabled to evaluate the effectiveness of his or her own problem-solving strategies, to assess the alternative learning resources to be activated and his or her actions together with the beliefs acted upon [22].

The possibilities offered by new technologies allow for the enhancement of the heutagogical perspective as they allow for student-generated content, promoting active engagement in the learning process through collaboration and self-reflection [23–24].

The need emerges for an education and training policy capable of enhancing social values as a means of stimulating knowledge, of harnessing personal and community intelligence as an engine for active participation in life’s challenges.

The right to learn becomes a resource, an opportunity within which to qualify that action which is a bearer of emotions, knowledge, resources and planning, which we call learning.

Educational strategies can no longer be generic but must specialise and differentiate on those dimensions that express the complexity of real life: multiplicity (functional, design and interpretation), reciprocity (bidirectional, interrelated, dependent), modifiability (in its enhancement of the processes of negotiation, transformation, codification), and intentionality (flexibility, openness to meaning, analogy, innovation).

The challenge for pedagogy is to think of new teaching and learning models capable of nurturing and supporting deep learning at all levels of the education system in order to generate lifelong opportunities for growth.

Learning opportunities are often unstructured within a multitude of networks and networks, where the learner decides the context and formulates autonomous and self-directed learning strategies. It is therefore crucial to enable the learner to direct his or her own choices, to enhance his or her competence to act and to be able to realise his or her own life project.

3. Culture as a driver of sustainable development

It has generally been acknowledged as a positive way of reaching communities and engaging them in inclusive growth. In other words, investment in cultural heritage can generate return in the form of social benefits and economic growth: as a matter of fact, the two notions of cultural heritage and inclusive growth are strongly interconnected and can contribute to social and economic development if investment is used in the right way. The Europe 2020 strategy and its flagship initiatives [25] recognise that:

“culture with its inherent elements of creativity and innovation is a value in itself. It has a significant public value and contributes to the achievement of smart, sustainable and inclusive growth as set out in Europe 2020 strategy and its flagship initiatives [...]; there is a need to turn the numerous challenges faced by cultural and creative sectors, including a rapidly changing environment driven by the digital shift and globalisation, into new growth and jobs opportunities, which requires action to be taken at different levels of governance”.

This view of the Council of the EU has been suggested in the 2018 European Year of Cultural Heritage, raising awareness of the social and economic importance of cultural heritage.

The European Parliament proposed in 2016 to approach holistically culture and creativity in the resolution intitled “*A coherent EU policy for cultural and creative industries*” [26]. The document states that the cultural and creative industries.

“have dual and intrinsic value since, through their direct links to artists and creators, they preserve and promote cultural and linguistic diversity, and strengthen European, national, regional and local identities, while sustaining social cohesion and contributing substantially, with various value creation models, to creativity, investment, innovation and employment and acting as a driver of sustainable economic growth in the EU and its Member States.”

As recognised by the Universal Declaration of Human Rights [27], culture is “indispensable for one’s dignity and the free development of one’s personality”.

Culture is the vehicle through which we communicate our identity, our values, our prospects for the future. Since otherness and identity are often defined in cultural terms, it is natural to move into the sphere of culture and the arts when the aim is to get to know others, to value their diversity and to create an inclusive society.

As a result, culture is the fundamental bond of communities, including the European community: without the clear recognition of the European project's cultural dimension, the future of the European Union as a common effort is hard to imagine. According to Rome Declaration, 25 March 2017, "We have built a unique Union with common institutions and strong values, a community of peace, freedom, democracy, human rights and the rule of law".

Due to its fundamental role in promoting shared values, democratic principles, quality of life and intercultural understanding among the peoples of Europe, the effects of ignoring the key role of culture to the sustainability of the European Union should not be undervalued.

UNESCO addresses this issue from the point of view of cultural diversity and cultural pluralism declaring in the Article 2 of the "UNESCO Universal Declaration on Cultural Diversity" [28] that.

"in our increasingly diverse societies, it is essential to ensure harmonious interaction among people and groups with plural, varied and dynamic cultural identities as well as their willingness to live together. Policies for the inclusion and participation of all citizens are guarantees of social cohesion, the vitality of civil society and peace. Thus defined, cultural pluralism gives policy expression to the reality of cultural diversity. Indissociable from a democratic framework, cultural pluralism is conducive to cultural exchange and to the flourishing of creative capacities that sustain public life."

In the same vein, the United Nations 2030 Agenda for Development, recognising that respect for all cultures and civilisations is crucial as a key factor for sustainable development, points to the promotion of intercultural understanding, mutual respect and tolerance within the framework of an ethic of global citizenship and shared responsibility. This document represents the first step by the international community towards the recognition that sustainable development is only achievable through the development of a sense of global citizenship.

In 2015, the UN General Assembly [29] adopted the resolution on Culture and Sustainable Development, affirming culture's role to the three dimensions of sustainable development, recognising further the natural and cultural diversity of the world, and acknowledging that cultural rights, heritage, diversity and creativity are core components of human and sustainable development and play a pivotal role for the 2030 Agenda to be successful.

In line with the above, at the meeting of the Education, Youth, Culture and Sport Council held in Brussels on 27 November 2018, EU Culture Ministers emphasised in the Work Plan for Culture 2019–2022 [30] that thanks to the European Year of Cultural Heritage, public and political awareness of the importance of culture and the enhancement of European heritage has significantly increased and that further efforts are needed to harness the full potential of the social and economic value of culture for building a truly inclusive Europe.

The Council of the European Union has recognised the power of cultural participation to foster "cultural diversity and intercultural dialogue, respect for differences and the ability to prevent and resolve intercultural challenges" through devitalising stereotypes and challenging prejudices and to promote social inclusion and integration of isolated and excluded groups. The Council has a similar position on cultural heritage, perceiving it as a strategic resource for its "capacity to help to reduce social disparities, facilitate social inclusion, and promote intergenerational dialogue and social cohesion" [31].

Heritage has generally been acknowledged as a positive way of reaching communities and engaging them in inclusive growth. In other words, investment in cultural heritage can generate return in the form of social benefits and economic growth: as a matter of fact, cultural heritage and inclusive growth are two strongly interlinked

concepts and appropriate, well-directed investments can contribute to the social and economic development of European countries.

In the course of life, each of us accumulates knowledge and skills that Bourdieu defines as cultural capital [32] and that can be employed in a way that resembles the use of economic capital. Hence the step towards cultural capital that refers to heritage through the connection with our past and the collective past of others through the development of culture as a constantly evolving competence in the form of stories and memory.

As stated by the Council of European Union [33], cultural heritage plays a key role in creating and enhancing social capital due to its capacity “a) to inspire and foster citizens’ participation in public life; b) to enhance the quality of life and the well-being of individuals and their communities; c) to promote diversity and intercultural dialogue by contributing to a stronger sense of ‘belonging’ to a wider community and a better understanding and respect between peoples; d) to help to reduce social disparities, facilitate social inclusion, cultural and social participation and promote intergenerational dialogue and social cohesion; e) to offer possibilities to develop skills, knowledge, creativity and innovation; f) to be an effective educational tool for formal, non-formal and informal education, life-long learning and training.”

According to the Council of the EU [34], the education in culture “can play an important role in combating poverty and in promoting greater social inclusion” and cultural heritage can be considered as “an effective educational tool for formal, non-formal and informal education, life-long learning and training.”

In the Migration and Refugee Crisis Report, published in 2017, the European Commission and EU Member States emphasised the need to empower citizens and cultural workers to promote dialogue through arts and culture by supporting cross-sectoral cooperation and building strong partnerships and networks [35].

A strategic step-by-step approach to international cultural relations followed by concrete actions for its implementation is crucial. “Such an approach requires a bottom-up perspective, encourage people-to-people contacts and promote intercultural dialogue”, according to the Council of the European Union [36].

4. Integrating scientific and cultural heritage in education

Learning plays an important role in improving the quality of life of people, particularly the most disadvantaged. The ‘well-being’ dimension of learning is becoming crucial in today’s society [37]. Providing a cultural asset in the condition to perform the function for which it was conceived and generated means enhancing it, allowing it to transmit culture [38].

Cultural heritage is intrinsically communicative; it was created to transmit and represent. Since they are signs, communication only takes place in the encounter with the public and plays a primary role.

It is not easy to express and define the emotion we feel the instant we admire a work of art or visit a museum, or in general when we enjoy a cultural asset. This ‘something’ escapes our definitions, but it is what makes our experience unique, gratifying, unrepeatably, immemorial and understandable. These emotions and this ‘feeling’ qualify the experience and characterise it as its own.

However, it is only recently that we have begun to explore the relationship between emotions and experience through heritage [39–41], understanding emotion as the key to understanding engagement with the common heritage.

“Emotion is a predominant influence in our daily lives. [...] It constitutes our experiences and colours our realities. Emotion dominates decision-making, commands attention and enhances some memories while minimising others” [42].

Emotions are an integral part of how we understand the world and gain insight into it. The impact with the objects and narratives of an exhibition, the context and pre-existing feelings influence the way we respond emotionally [43].

Emotions help us decide what we should pay attention to. We can easily become overwhelmed by the stimuli coming at us, the number of objects and people, the amount of text and information. The process that leads our brain to decide what to pay attention to and what not to, seems conscious. But in most cases, it is driven by our emotions that push us to decide what to notice, how to react and what to learn, to evaluate interesting or insignificant objects, sounds, colours, smells, tastes and spaces [44].

Emotion plays an important role in the learning, experience and satisfaction of the viewer of a work of art [45, 46].

As Robinson has pointed out, “any engagement with the world and its peoples is an emotional engagement, in the sense that we do not read, experience or remember the world and our place in it, only as fact and without feeling, without judgement, without consideration of value and without evaluation processes” [47].

Enabling visitors to actively participate in museum practice, and thus freeing them from “isolation” as mere “passive” recipients, has become an increasingly common practice. The concept of participation, however, does not only include the idea of visitor engagement within the museum or the exhibition space, but also points at an ever-changing interaction between the institution and the public, whereby involvement is understood, intentionally or inevitably, as an intervention in existing structures and working processes [48]. In some museums, participation now seems to belong to everyday practice, especially where the focus is more on the public.

Differences in attitudes, expectations and responses mean that museums and its heritage sites must be able to cater for a wide range of visitors [49]. There are numerous strategies through which the museum can fulfil its social role [50].

The task of making people feel emotions was born together with the museum itself. The emotion that was focused on at the time was to amaze people, to arouse curiosity and to encourage an educational approach. The Wunderkammer are a great example of this.

Later the relationship between emotion and learning prevailed. In the nineteenth-century museum, people go to learn, but learning always remains subservient to emotion, to the emotion of entering the museum. An example of this are the anatomical museums.

More recent exhibition strategies aim instead at fostering emotions, which are the key to visitor engagement. Each visitor has very different needs and expectations and reacts to objects and places in a unique and sometimes unexpected way [51]. And it is precisely the increasing orientation towards satisfying the visitor that directs museums to choose a representation of the collections that is closest to the visitor [52].

The increasingly new ‘interactive’ relational tools make the museum a place of continuous education [53]. People visiting a museum have the possibility to participate not only in meetings, conferences, leisure and recreational activities, but to generate contents with proposals that can in turn interact with the museum in a different way.

The public is not content to receive passively but wants to feel the link between itself and the environment it is experiencing [54].

By identifying a correlation between the museum and the emotional and cognitive approaches of the visitor, it is possible to develop personalised models [55, 56], which offer a unique experience that reduces the risks of indifference or overstimulation [57].

The connections between heritage education, active citizenship and identity education are now numerous [58, 59], but further reflection and experimentation is needed to make this connection usable at any age and through self-regulated methodologies that allow learners to be actors in their own education.

Existing studies investigated the implementation of heritage education in formal and non-formal settings with particular attention to the use of information and communication technologies [60–64]; other research has carried out qualitative evaluations [65, 66] and analysis of educational resources. Studies on accessibility and social inclusion through heritage have been added [67] with the aim of deepening learning with particular attention to people with functional diversity [68, 69].

All this research has certainly contributed to establish a systemic and participatory vision of cultural and scientific heritage and heritage education [70], and to provide a basis for the relationship between life skills, learning and heritage. Much still needs to be done to achieve personalised learning as “...having students go through their own paths to whatever endpoint they desire. How you take the path and where you end up is totally dependent upon the strengths and interests of the learner” [71].

A strong response to the question of what constitutes “21st century competences” has been an increased focus on the need for lifelong and lifewide learning.

5. From “didactics of differences” to a participatory and intercultural heritage education in healthcare. The educational model connected to the Museum of Ethnomedicine of the University of Genoa

Education for diversity became a central theme at European level in the mid-1980s, when the notion of interculturality was introduced in UNESCO policies. We moved from the didactics of differences, an expression coined in the wake of the first educational projects, to heritage education in a participatory and intercultural key. In fact, it is unthinkable to work in an ethnographic museum and not try to build up a participatory practice of heritage, at least starting from the community of students, school groups, and curious people who visit the museum.

If we think about health, a multi-ethnic society requires attention to traditional healing practices and highly qualified staff, able to understand the way different ethnic groups live disease, conceive health and implement prevention strategies is fundamental, to optimise the healing process. Biomedicine, used in the western world, has the limitation of not taking into account the uniqueness of the individual and the culture to which they belong.

This is why a different, broader, holistic and less academic training of future health personnel is necessary to overcome what can become an obstacle to treatment, namely non-compliance with health personnel. Indeed, let us not forget the importance of the latter and of the placebo/nocebo effect it can have on the patient. The therapist can be a catalyst in the healing process or, paradoxically, can also frustrate the results of effective treatment.

The knowledge of traditional care systems by future health professionals is essential today. Caring necessarily implies a holistic vision and combines scientific knowledge, technical expertise and interest in the sick person; it implies listening skills and affectivity.

Migration has caught European countries unprepared, as they have not yet developed policies that are truly inclusive in terms of health and well-being. Hospitals and the various social and health services are slowly equipping themselves with measures to deal with what is often seen as an intercultural emergency in the true sense.

Intercultural mediation is certainly a decisive component, although it is certainly not the exclusive component, of health care planning that addresses this emergency.

The educational experience that the Museum of Ethnomedicine of the University of Genoa [72] has been engaged in for years as a vehicle to sensitise future health professionals to other cultures is part of this framework. Antonio Scarpa (1903–2000) was the pioneer of these studies (**Figure 2**). A tireless traveller, he travelled the five continents for almost sixty years, collecting objects, remedies, instruments, texts, etc. relating to the traditional medicines he encountered, observing that the different therapies were based on a cosmological principle. The A. Scarpa Collections constitute a unique collection of objects from over 100 human groups related to the different medical traditions of the world.

Within the teaching of Health Anthropology at the degree courses of Health Professions (Physiotherapy, Speech Therapy, Health Care, Professional Education, etc.), held by Prof. A. Guerci [73], Emeritus Professor at the University of Genoa, and by the author of this contribution, an exclusive space has been dedicated for years to the visit to the Museum of Ethnomedicine of the University of Genoa and to the discussion on the treatment systems of cultures different from ours.

Since the academic year 2013–2014, every year, this teaching has raised awareness of caring in respect of cultures over 350 students of Health Professions.

The approach to Traditional Medicines involves a highly topical reading of health, anthropological, social and ecological problems related to health, well-being and the environment. In order to cure himself, man has always drawn remedies from his habitat, adopting different therapeutic strategies according to climatic, phytogeographic and faunal characteristics, as well as to peculiar cultural and socio-structural typologies.



Figure 2.
Ethnomedicine museum a. Scarpa, University of Genoa, Italy. Source: Ethnomedicine museum, University of Genoa (scientific director: Prof. A. Guerci).

Every human population, in every age, through its own culture, builds a particular representation of the world, from which result particular constructions of the body and therefore of health and disease.

Starting from a particular perception of the body, anatomy, physiology, biology, the position of the human being in the animal world, the notion of normal and pathological, each culture elaborates constituted knowledge, transmits it, and declines it in the everyday world and on institutional occasions (**Figure 3**).

The aim of the course is to enable students to master the main theoretical-methodological reference frameworks aimed at investigating the socio-cultural processes that revolve around the relationship between health/disease and medicine and to possess the conceptual and communicative tools to engage in the formation and application of anthropological knowledge in healthcare contexts (**Figure 4**).

Human experience is essentially characterised by a bodily and relational dimension: the body 'emerges' as the material and form of existence through its relationships with the physical and human environment. The anthropology of health studies the relationship between body and society in many of its declinations, attempting to explore the ways in which the body is at once experienced, expressed and affirmed, but also constantly constructed and socially reconstructed. As such, the body falls ill and is treated 'socially', illness being the 'embedded' result of specific social relations and treatment the mobilisation of collective resources to explain and treat suffering (and the collective risk it entails). The course covers the main theories developed in anthropology on health, the body, suffering and illness, and explores issues related to traditional knowledge of care, migration and health inequalities.

The strategy of self-determined learning (eutagogy), a student-centred educational tool that promotes the development of autonomy, skills and abilities, has

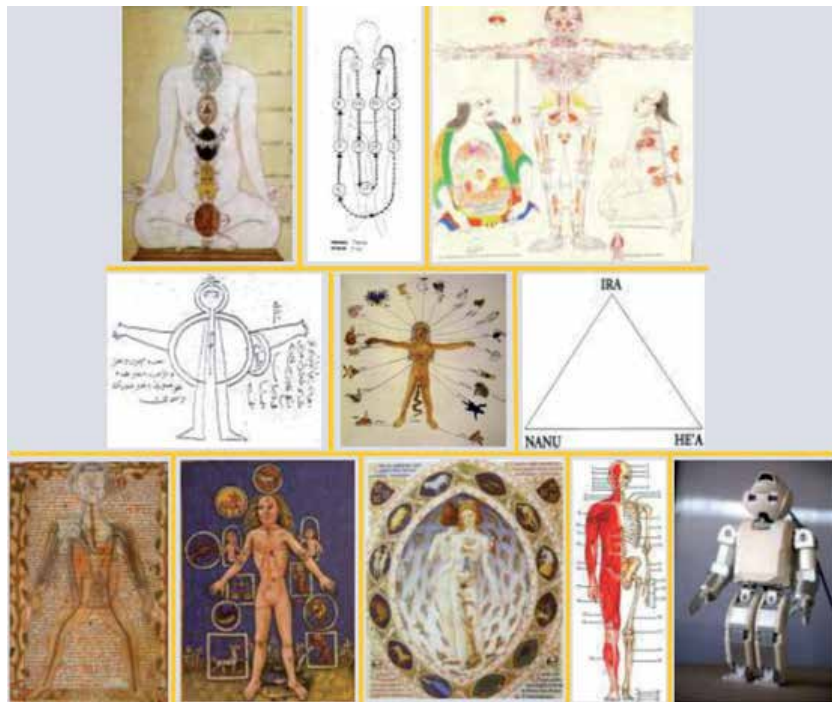


Figure 3. Different representations of the body. Source: Ethnomedicine museum, University of Genoa (scientific director: Prof. A. Guerici).

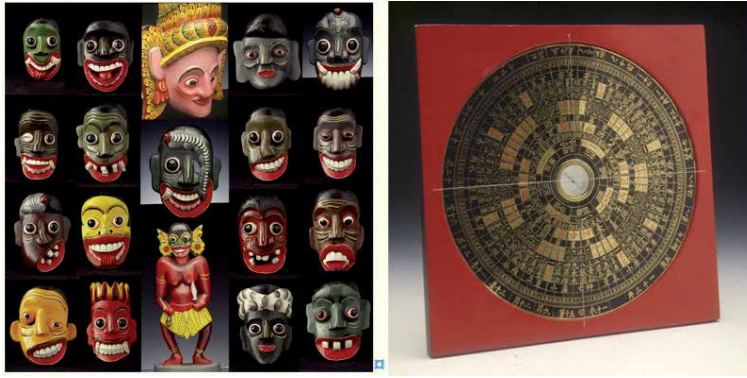


Figure 4. Tools of diagnosis and tools of prognosis. Source: Ethnomedicine museum, University of Genoa (scientific director: Prof. A. Guerici).

been used for many years. The aim is to train students who are well prepared for the complexities of the world of care and to teach them to learn on a lifelong basis.

At the beginning of the COVID-19 pandemic, we were faced with the impossibility of implementing an important part of the course, as museums and art venues were closed.

The course was therefore restructured in blended mode so as to allow students to enjoy, albeit in a different way, the opportunity and benefits of self-determined teaching through the use of ICT tools. **Figure 5** below illustrates the model of a fully online course.

The lectures, the visit to the Museum of Ethnomedicine, the material for discussion, the in-depth meetings and the final presentation by the students were realised thanks to the use of the e-learning platform and videoconferencing products chosen by the University (access via single sign on).

Stand-alone videos were prepared with the theoretical framework and insights. The videos and bibliographical reference materials (books, scientific articles, photographs, film material) were published on the Moodle platform dedicated to distance learning (Aulaweb) according to an architecture capable of allowing students to proceed with their studies autonomously and self-determined.

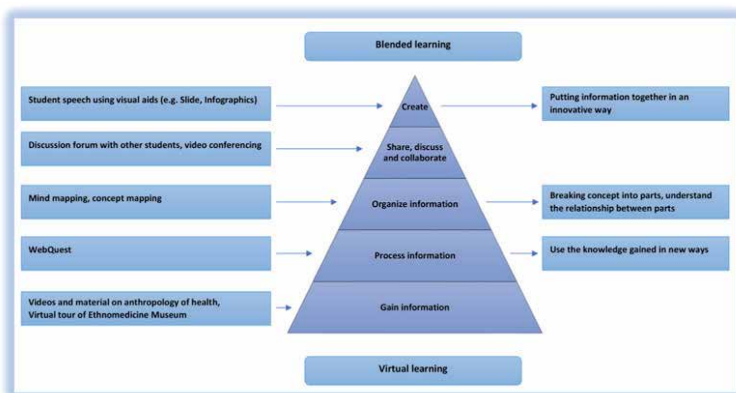


Figure 5. Blended course model of health anthropology with museum training in a pandemic scenario. Source: Own elaboration.

In place of the visit to the Ethnomedicine Museum and the face-to-face group work, which has been carried out for years as part of the teaching programme, students were asked to work in groups using WebQuest (<http://webquest.org/>), a teaching model geared towards research and investigation that allows students to work critically and coherently on the web, without exposing them to an endless supply of materials whose authority is often unverifiable.

Students were asked to choose a task (case study) from various assignments related to healing practices and to link it to one or more objects in the Ethnomedicine Museum, motivating their choice and reflecting on its use.

The central element of the WebQuest is the “authentic” task, which is considered necessary for acquiring situated and deeper conceptual understanding.

In order to acquire this kind of knowledge it is not enough to transmit knowledge of facts and procedures to the students, but to engage them in activities similar to the real ones performed by professionals, i.e., authentic practices. Students must be able to transfer knowledge of facts and procedures to the real world and be able to modulate procedural knowledge according to the situation.

In times of pandemic, students were invited to virtually visit the museum through the dedicated website (www.etnomedicina.unige.it), to consult the exhibition catalogue and dedicated videos; then to carry out research on the web based only on the materials provided and screened by the teacher.

To tackle the task, students used the sources provided by the teacher, so that they could concentrate on analysing and interpreting them instead of identifying them.

In addition to the task, resources and instructions for carrying out the task, the teacher also identified and communicated clear criteria on the basis of which he or she would judge what had been done.

During the whole WebQuest process, the teacher accompanied the students in his or her scaffolding function, providing them with guidance for analysis, material and tools for the development of the final assignment.

At the end of the process of the assignment, the students produced a synthesis work in a variety of forms: report, video, text and images, etc.

The students were asked to present their work, to motivate the choice of assignment in relation to their future profession and life experiences. The sessions were very well attended, especially since many students commented on the work of their fellow classmates, enriching the discussion with further narratives and personal experiences.

A number of issues emerged that will be explored in further specific seminars to be proposed in the years ahead.

This was followed first by a well-reasoned peer review and finally by the lecturers' evaluation.

Finally, the students were asked to identify the strengths and weaknesses of the whole educational process. This aims at identifying areas for improvement in a bottom-up way.

Among the strengths was the fact that the students were able to appreciate a cultural asset that they did not know, even though it is owned by the university where they study.

In addition, the students were able to see health and illness through other eyes and find scientific relevance in any of the courses they attended.

They also appreciated the material provided and the stimuli for further study, as well as the integrated teaching method between theory and practice, between medicine and the humanities, between science and culture.

There were also some weak points, represented by the teachers' need to integrate the interdisciplinary team with other professionals who could have further

enriched the discussions, for example epidemiologists, nutritionists, international cooperators.

ICT tools were fundamental, even though the students' skills are unfortunately still scarce.

In terms of the disciplinary competences acquired, the students demonstrated an understanding of the role of cultural values in defining health and that these values are transmissible through the material and non-material heritage that we all too often neglect.

In the discussion of their work, students noted that in the biomedical view, the biological dimension is seen as the only measure of well-being and the potential of culture as a key element in maintaining and improving health is neglected. The students seem to have realised that the provision of health care needs to be made much more sensitive to cultural aspects and that this sensitivity is acquired continuously, throughout life.

In terms of communication skills, the method of prevailing self-directed study and case discussion has achieved excellent results, fostering the organisational, team and communication skills crucial for a future health professional and allowing adequate and stimulating flexibility of study and investigation.

In short, this participative, intercultural methodology, built on a unique heritage, has shown over time a high educational value and an incredible interest from the students. It has proved to be an effective tool for raising awareness of the material and immaterial cultures that populate the world. The added value is determined by the interconnection of the objects, artefacts and testimonies of the museum with the programme proposed in the lessons. The discussion space in front of the testimonies encourages questions, doubts, sharing and discussion.

6. Conclusion

Cultural heritage holds the resources inherited from the past, in all forms and aspects – material, immaterial and digital (originally produced in digital and digitised form), monuments, sites, landscapes, skills, knowledge, practices and expressions of human creativity, as well as the collections preserved and managed by museums, libraries and archives.

Our heritage originates from the interaction over time between people and places and is constantly evolving.

Being of great value to society in cultural, environmental, social, educational and economic terms, cultural and scientific heritage, its valorisation and promotion became therefore a strategic choice for the 21st century in line with the 2030 Agenda for Sustainable Development's target 4 of Quality Education for all.

Today, in particular, globalisation and migration require educational institutions to pay special attention to teaching young people and adults to deal with cultural difference and to value diversity in lifestyles, worldviews and beliefs. This is particularly important in the context of health, where diversity can generate misunderstandings and even hinder healthcare.

It is not easy, however, in some contexts such as that of the health professions, to propose ways of humanising care and thus succeed in enhancing the educational experience by transmitting the idea of diversity as a resource and value for everyone.

New forms of knowledge transmission can come to the aid of teachers and make it easier for them to sensitise learners and stimulate in them a way of thinking critically. This can be useful in the profession and in life.

Designing or producing something to meet individual requirements become a need because enables learners to enjoy choice in the learning process and to define the end results of their learning. The personalization of processes is very important in today's education, because the current educational paradigm has a predefined outcome for all persons: no matter how each one gets there, everyone must get to the same point.

Accordinging with Gesche-Koning [74], “synergies between the cultural heritage and education sectors are the best way to achieve inclusive, integrated heritage-based education towards a sustainable development [...] and to “poetically inhabit the world.”

With the help of ICT, distances can be reduced, and difficulties erased.

It becomes crucial to train educators to work in an interdisciplinary and cross-sectoral way (academies and non-academies) in order to develop interactive forms of education capable of attracting lifelong attention and not only transferring knowledge, but tools for a critical reading of the reality around us.

The experience proposed represents a model of integration between the promotion of lifelong education, the enhancement of lesser-known cultural heritage and social inclusion and spreads a well-rounded culture of “taking care” of people, cultures, rights, and identity in history and contemporaneity.


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Disrupting Certainties: History Education for Informed Lived Citizenships

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Abstract

How might teacher education engage pre-service teachers with unfamiliar voices and historical representation in an age of diversity, and view history as a critical project for young citizens? This context is situated in an Aotearoa New Zealand university's initial teacher education (ITE) secondary programme. As a history educator, I negotiate multiple sites' cultural practices and legacies of doing and being. I juggle professional, curriculum and assessment discursive practices and teachers' certainties about their history programmes. This involves history theorising, scholarship and expectations. Tensions exist in relation to 'sacred' history contexts and knowledge claims embedded in curriculum and assessment standards that act to lessen possibilities of critical approaches. Critical pedagogy informs my stance that young citizens need to be confident and informed about their identity/ies and lived pasts to question what counts as knowledge and in whose interests this knowledge serves. Problematised history pedagogy (PHP) research aimed to disrupt pre-service teachers' normative discourses. Emergent findings have subsequently shaped my history programme's pedagogic approaches and evidence-informed assessment. Recent scholarly and public interest in histories that 'play out' in Aotearoa New Zealand's present, serve to refocus history in ITE and schooling spaces to disrupt pedagogic certainties and exclusive notions of citizenship.

Keywords: history, citizenship, critical pedagogy, problematising, discourse

1. Introduction

In this chapter, I reflect on my history pedagogy in a secondary ITE programme, and on ways a critical stance reimaged school history's curriculum intent, pedagogies and outcomes for informed future-oriented young citizens. The backdrop of Aotearoa New Zealand's society is introduced to indicate that citizen students and teachers move across a diversity of real and imagined 'lifeworlds' ([1], p. 176). Dynamic socio-historical forces are forging educational change in Aotearoa. Intercultural relationships and the centrality of Te Tiriti o Waitangi¹ influence ITE and school history's contextual and practice decision-making. Māori history is being introduced into the schooling curriculum as a foundational continuity of Aotearoa New Zealand histories.

¹ Te Tiriti o Waitangi is Aotearoa New Zealand's foundation document. It was signed on 06 February 1840 by representatives of the British Crown and Māori chiefs. Te Tiriti o Waitangi is a living blueprint for a hopeful and optimistic future.

Secondary history education is positioned alongside discursive cultures and practices of the academy, public histories and professional, curriculum and assessment policy' standardisation. Accordingly, as a teacher educator, I am pulled all ways in relation to history education's identity, purpose, pedagogies and production [2].

Personal theorising of history and an awareness of curriculum and assessment discourses have disturbed my practice and shaped my critical pedagogy stance. Consequently, I have sought to disrupt pre-service teachers' conceptual certainties about the nature and purpose of history and the school history curriculum within my teacher education work. I view the notion of 'certainties' as the reproduction of history education approaches whereby custom and practice pedagogies, teacher preferences and certitude, act to reproduce familiar contexts, narratives and voices. I reflect on a Problematised History Pedagogy (PHP) intervention designed and implemented within doctoral narrative research. The PHP explored how problematising history curriculum and pedagogy in history teacher education engaged self-fashioning of teaching identities, history conceptions, and reimagining's of curriculum as discursive practice [3]. The PHP research design and a Dismantling Analysis (DA) method are introduced as a critical pedagogy approach. Aspects of the PHP findings are glimpsed through the pre-service history teachers as research participants' voices. The PHP research processes and findings continue to inform my teacher education with pre-service history teachers, and I discuss history pedagogy in relation to young people's lived citizenships.

2. Backdrop: Aotearoa New Zealand society and citizenship

The 1840 Treaty of Waitangi enabled Britain to establish sovereignty over New Zealand, legalise British subjects, and secure the economic benefits of imperialism. The Treaty of Waitangi and Te Tiriti o Waitangi illuminate language and values-based culturally encoded interpretations of sovereignty, and ways indigenous Māori were merged with British subjects by Treaty article. For Māori, colonising processes brought marginalised political representation, land loss, social and economic neglect and indifference for Treaty rights. Māori have never ceased to resist or to seek redress for breaches of Te Tiriti o Waitangi - viewed as a sacred covenant with the British Crown. The relationship between indigenous Māori and Pākeha settlers is a central feature of subjecthood and citizenship in Aotearoa New Zealand's history of colonisation and recent decolonising processes. Ongoing migration has been a significant feature of citizenship and identity shaping of the governance of the settler state and of increasing cultural diversity [4]. The Royal Society of New Zealand's census findings show that Aotearoa New Zealand is increasingly a country with multiple cultural identities, languages and values, and that one in four people living in New Zealand in 2013 were born in a diversity of places elsewhere than New Zealand. The report states:

“The most important example of ‘diversity’ may be in the range of ideas about what is represented and what is valued. A longstanding and deep-seated desire on behalf of the majority community to identify as New Zealanders with a single set of values and practices will be even less apt than in the past” ([5], p. 3).

Citizenship as an ideal will need to reflect this increasing diversity in relation to legal rights and political freedoms and choice, forms of economic and social equality, and identity and belonging. This may manifest as being community or service-minded, participation in clubs and societies, issues-based

social action and/or global and digital awareness. Whilst citizenship assumes a body of common political knowledge [6], conceptions of ‘multiple citizenships’ challenge unitary citizenship ideals and politically focused citizen envisioning. Accordingly, identity is perceived in relation to a range of affiliations including national, cultural, religious, indigenous, ethnic and political and globalising processes, and citizenship is re-evaluated as an identity tied to the nation state [7, 8]. The cultural theorist James Banks interrogated liberal, assimilationist, and universal conceptions of citizenship in seeking cultural rights for citizens of diverse cultures, ethnicities, and languages [9]. Feminist and indigenous scholars have challenged assumptions of citizenship as unitary and inclusive sources of identity and belonging.² Debates about Article 3 of the Treaty of Waitangi and Te Tiriti of Waitangi texts have considered the rights of citizenship, and whether Article 3 guarantees Māori equal opportunities or outcomes. Māori tikanga regulates ‘belonging’ and citizenship in Te Ao Māori^{3,4}.

Citizenship in practice is a powerful cultural construct shaped by dominant groups’ values and beliefs about who might identify and belong as a New Zealander. Pearson [4] has conceived citizenship as double-edged, reflecting norms of inclusion and exclusion, and ideals of belonging voiced by those with the power to express and action ideals. This calls into question nostalgic and prevailing beliefs in Aotearoa New Zealand; that we are good at human rights. Findings of a study about New Zealand’s signing of six major human rights treaties since the 1970s and alignments with issues in contemporary society were reported in ‘Fault Lines: Human Rights in New Zealand’ [10]. It was found that New Zealand was slipping behind in relation to child poverty, gender equality, systemic disadvantage of Māori, and the rights of disabled people to challenge the state. Citizenship is contested, whereby Pākehā⁵ are one cultural group among many. Citizenship also presents an open space that values diversity and lived citizenships. Researchers Kallio, Wood, and Häkli offer a critical explanation of ‘lived citizenship’:

“...lived citizenship refers to issue-focused, relational and motivated political agency which involves specific orientation, reflexivity or intentionality. These non-essentialist criteria are intended to unsettle dominant notions of the citizen and to recognise the deeply varied experience of being a citizen – especially providing space for the inclusion of those traditionally excluded from the status and esteem of citizenship” ([11], p. 724).

In the context of disrupting certainties in history education, my reference to ‘lived citizenships’ aligns with schools’ history students’ diversity, embodied crossings of lifeworlds, and sense of belonging and agency.

² In secondary schooling, students achieve credits for curricula coursework via internal and external assessment across their senior years (11-13). The New Zealand Qualifications Authority administers qualifications for general schooling over three levels of the National Certificate of Educational Achievement (NCEA).

³ Ruth Lister, *Citizenship: Towards a feminist synthesis*, *Feminist Review* 57; 1997. 28-48; Anne-Shela Orloff, *Gender and the social rights of citizenship: The comparative analysis of gender relations and welfare states*. *American Sociological Review*. 58.3; 1993. 303-328; Mason Durie, *Te Mana, Te Kawanatanga. The Politics of Maori Self-Determination*. Auckland: Oxford University Press; 1998.

⁴ Tikanga is a Māori concept and practice that refers to customs, lore, protocols, values. Te Ao Māori refers to the Māori world in richness and depth.

⁵ Pākehā is a Māori word for people who are non-Māori New Zealanders. The use of Pākehā conveys an identity in relation to Māori.

3. Complex crossings: history in initial teacher education

In Aotearoa, history education is filtered through national curriculum and assessment policies and the teaching profession's code of standards.⁶ University compliances around digital and online teaching systems, standardised outlines and performance-based research funded outputs also influence the design of teacher education curricula. History papers offered in universities constitute degree specialisms for the teaching of history in the senior years (11–13) of the secondary schooling curriculum. Depending on paper selection and the visions of academic historians, undergraduates engage with a range of historical approaches and discourses including for example, scholar traditional, social reconstructionist, indigenous, interdisciplinary. Pre-service teachers generally enter ITE with history offerings that may not connect with history contexts for study in senior secondary classrooms. Consequently pre-service history teachers fall back on traditional history contexts and approaches they experienced at school. Research findings that focused on teacher perceptions of 'their' history curriculum [12] indicated that within five years of teaching, history teachers had assimilated into cultures of school history that maintained certainty about claims to knowledge and perpetuated familiar contexts for assessment purposes. This finding confronted my pedagogy in ITE to activate critique.

The national curriculum policy [13] and qualifications frameworks [14] position history in the Social Sciences Learning Area. Whilst historical contexts, ideas, and skills can be developed in social studies programmes through all primary and secondary school years (1–13), history is taught as an optional subject specialism through Years 11–13 in the senior school. This is dependent on staffing expertise and capacity. In 2020 history education is positioned in competition with social sciences curricula offered in the senior school (E.g. sociology, psychology, education for sustainability, legal studies, business studies, tourism). However, students choose history because of an interest developed through junior secondary social studies, 'cool teachers', curiosity about histories that support hobbies, or through a sense of historical consciousness [15] that permeates daily lives.

3.1 Curriculum, policy and disturbance

My professional work in social sciences and history teacher education has involved contractual work for national curriculum and assessment developments. However, during the review and revision of the national curriculum (2007) I recognised my complicity with neo-liberal discourses of curriculum⁷ and grew increasingly disturbed with my pedagogy that provided little space for questioning why we do the things we do in history curriculum across ITE and schooling sites? Standards-based curriculum objectives could not be left unquestioned, particularly as the revised national curriculum developments [13] represented a shift back to a traditional and neo-conservative envisioning of the history curriculum. A default kind of curriculum was introduced by levels of history achievement standards for national certificates' qualifications [14]. Despite opportunities for teachers to introduce unfamiliar contexts into history programmes, the history achievement

⁶ Education Council of New Zealand. Our code our standards: Code of professional responsibility and standards for the teaching profession Ngā tikanga matatika ngā paerewa. Wellington, NZ: Author; 2017. <https://teachingcouncil.nz/professional-practice/our-code-our-standards/>

⁷ Neo-liberal discourses project the growth of the economy as the means to address social and educational issues. Individualism and self-interest is a key value in these discourses. In my experience of Aotearoa New Zealand educational policy reforms since the late 1980s, an inherent hetero-normativity operates within these discourses to perpetuate exclusive gendered curriculum and pedagogy.

standards' guidance for teachers indicate 'sacred' [16] custom and practice teacher choices of historical content. Commonly, teachers' topic preferences focus on histories from Pākeha colonial perspectives, twentieth century theatres of war through discourses of sacrifice and nationhood, exclusive gendered experiences peppered with the 'odd' woman worthy. Despite standards-oriented possibilities to engage young people with historical inquiry, perspectives and source interpretation, curriculum objectives, assessment standards and contexts for study reflect a 'history as progress' discourse that serves to preserve normalised discourses of historical inquiry. Substantive content-based pedagogy is generally produced at the expense of the 'hows' of history. More troubling is the minimisation of the nature, purpose and 'whys' of history education. Standards shape historical 'knowing' in powerful ways [17]. However, there needs to be more to history in teacher education than reproducing standards' outcomes from custom and practice uncritiqued pedagogy. In the following section, I recount my conceptions of history that have developed through research as a reflection of teaching selves, and as a response to potentially volatile moments of cultural production ([18], p. 5).

4. Conceptualising teaching selves, history and pedagogy

In my search for spaces of professional and academic negotiation in a university environment, discourses of critical social reconstruction and feminist and post-modern assumptions shape the educational selves I choose to embody and voice. I conceive teaching identities as multiple "...found in culture and thereby discursively produced and legitimated" ([19], p. 153). Teacher selves are revealed in power relations, gendered expectations, and learners' assumptions ([3], p. 72). These selves are based on the "... immense significance of actual people and places, as real, as memory, imagination and desire in the formation of selfhood in teaching and learning" ([20], p. 183). Despite the limitations of policy and structural arrangements and established cultures of school history, pedagogy in ITE can open spaces to reflect on why we do the things we do in light of our identities, and the selves we choose to be.

In this time of diversity and uncertainty, a questioning of knowledge claims shapes personal and professional history theorising. The notion of disturbance resonates with my history education work. It is in the observation of lived experiences of the past and the performative moments of disturbance and change, that dialogue can be activated between the past and present. Jenkins [21] argues that history be understood as a post epistemological aesthetic discourse as infinite refigurings and multiple meanings. Deconstructive histories bring into view previously discounted, unseen and unheard voices of the past. Research brings new inquiries and meanings, and historical narrative gets personal to reveal the historian's voice. Brown offers a helpful explanation of historical narratives that disturb grand narratives and authoritative claims to history:

"A historian may deploy references to historical events in his/her narrative that are verifiably true, but her/his discourse is about selecting and bundling references to events of his/her choice into a periodised and bounded-off interpretive narrative defined by her/him, that as a whole is invariably untestable. It is this narrative that is the real end product of the History profession, and if its constituent 'small' facts may be verifiable, the thing as a whole is fictive in form ..." ([22], p. 171).

An exciting dimension of historical inquiry is when the nature, purpose and the 'doings' of history are emphasised. Rosenstone, a historian of film genre comments that history matters – that it needs to be meaningful:

“We must tell stories about the past that matter not just to us: we must make them matter to the larger culture. We must paint, write, film, hip hop and rap the past in a way that makes the tragedies and joys of the human voyage meaningful to the contemporary world” ([23], p. 17).

The historian’s motivations and uncovering of voices and silences, opens possibilities for curriculum history. Likewise, representation of lived pasts through a variety of literacies, media, and digital tools brings opportunity for new questions and meaning making to savvy citizen learners. This means pedagogic approaches may include access to sources of evidence of unfamiliar place-based pasts, multiple voices and human agency. Pedagogy involves a relational dialogic [24] that activates knowing and learning, and pedagogies are constructed to take material and social form. Mulcahy suggested pedagogy be viewed as an “emergent property or product of ‘intra-action’ among persons, places, processes and things” ([25], p. 57). I reflect pedagogies as connecting four key dimensions as: the immense significance of people’s identities and situatedness; relationships; embodiment and seeking of authentic selves; knowledge claims related to socio-historical, cultural, structural and material production of meaning. My growing disturbance with un-critiqued school history activated critical pedagogy research that I designed as problematised history pedagogy (PHP) [3]. The desire to mitigate powerful relations in classes and enable pre-service teachers to challenge exclusive historical representations, motivated me. Curriculum and pedagogic disturbance, reflexivity and resistance shaped my critical pedagogy as research within teacher education.

5. Critical pedagogy: problematised history pedagogy as research

Critical pedagogies involve “understandings and critique of hegemony and power as an organising force in education” ([3], p. 78) to ask questions of the politics of curriculum through reflexive action. Influential cultural theorists have influenced my pedagogic stance. Henry Giroux and the late Joe Kincheloe have viewed teachers as intellectuals who understand power relations and the impacts of their pedagogies for self, society and cultures.⁸ When applied to history curriculum, critical pedagogy demands that we question what counts as history knowledge; whose interests this knowledge serves, and how curriculum and assessment as discursive production serve to legitimise existing forms of historical knowledge?

5.1 The PHP research design as a ‘System of Meaning’

The PHP research as a ‘System of Meaning’ [26] was nested and constructed within my doctoral critical pedagogy methodology: ‘Problematised History Pedagogy as Narrative Research: Self Fashioning, Dismantled Voices and Reimaginings in History Education’ [3]. The wider narrative research methodology’s question set the scene: “How does problematising history curriculum and pedagogy in teacher education engage self fashioning of teaching identities, history conceptions, and reimagining of curriculum as discursive practice”? ([3], p. 1). Three further questions emerged to deconstruct this guiding question, and to create an original dismantling analysis method. These questions applied to self-reflexivity,

⁸ Henry Giroux’s reconstructive discourse for students’ consciousness-raising whereby their voices might be heard, positions society as an ethical and hopeful project. Both Giroux and Kincheloe have advocated critical pedagogies as enabling ways of thinking freed from traditional and fixed boundaries of knowledge.

engagement with problematised pedagogy, and evaluation of critical pedagogy and emergent pedagogic spaces ([3], p. 123).

The PHP involved my history class' ten participants in fashioning teaching identities, identifying personal narrative stances, and thinking critically about activating and reflecting on history pedagogy in classrooms. The PHP research was implemented over a year within my secondary GradDipT year's history programme in ITE [3]. The participants as history graduates from a range of Aotearoa New Zealand universities, brought their conceptions of history, lived experiences, and school to university – back to the classroom contextual preferences and knowledge to the class programme. The PHP research design drew on the late Joe Kincheloe's thinking about critical pedagogy to shape a coherent 'system of meaning' ([26], pp. 224–225).

Figure 1: 'Problematised History Pedagogy as a System of Meaning and Dismantling Analysis' indicates the research design's aim for coherence in relation to questions, processes, analysis, and its reciprocal layering within my wider methodology of critical pedagogy as narrative research. The PHP embedded three processes that I adapted from Joe Kincheloe's critical action and reflexive research processes ([26], p. 224–225) namely: Phenomenological Empathy; Genealogical Disclosure; Discursive Self-Fashioning.

Phenomenological Empathy elicited evidence of the participant's values and reflexivity through the history class' ongoing journal writing, critical discourse analysis of a self-selected history text and post teaching experience conversations.

Genealogical Disclosure initiated participants' life-storying, socio-historicising of self-texts, and individual's private and professional theorising of the nature and purpose of history in the senior school curriculum.

Discursive Self-Fashioning involved participants in designing, implementing and critiquing sequences of their own problematised history pedagogy with history classes whilst on their second practicum. This involved teacher identity work, and formative stages of engaging with curriculum and pedagogy as pre-service history teachers.

The research processes constituted both on-campus class (56 hours) and practicum experiences (14 weeks) of activities interspersed throughout my programme of history pedagogy through February–November. The PHP timetabling was indicated within the paper outline, along with detailed guidance for the life-storying, critical discourse analysis (CDA) of a self-selected text, and participant's planned and implemented sequences of PHP. By mid-April participants had completed their life histories as self-storied accounts; by mid-July the critical discourse analysis (CDA) of self-selected curriculum history texts was complete. Over the second teaching experience (August–September) class members designed, planned, facilitated, and evaluated a sequence of PHP (3 teaching episodes) in senior secondary history classrooms in response to their own pedagogic disturbance. These evidence-based processes were shared through the year in our history class, and are presented as PHP case studies in the wider narrative research [3]. Participants' journal writing, and their experiences of research processes were regularly shared and discussed during our history class pedagogy. None of the research processes was designed for, or used for assessment purpose. To meet coursework outcomes within the secondary teacher education programme, participants completed three assessment items that were not part of the PHP research. Accordingly, an external examiner assessed this assignment work.

5.2 The PHP dismantling analysis method

A Dismantling Analysis (DA) resonated with my history and social sciences theorising and practice, and aligned with critical gazes within the wider narrative

research methodology. Deborah Britzman's thinking about ways postmodern thinking expands the range of available interpretive schemes to make possible readings of cultural texts influenced my decision about a method of analysis and interpretation [27]. I sought deconstructive and interpretive purpose to identify contradictions, normalised discourses, disturbances, and resistances in the participants' PHP research processes. The notion of 'mantle' embodies ideas of expertise, identity, validation, knowledge, wisdom, and authority. However, in the DA, I conceptualised the idea of 'mantle' in critical ways: Hence 'mantle' symbolised a curriculum boundary, was viewed as a layer of hegemony, represented powerful discourse, acknowledged as a cloaked and weighty tradition and as essentialist notions ([3], pp. 133–134). The DA involved recursive interpretive work to unravel participants' private and professional theorising of history and curriculum representation, pedagogic identities, conceptions of pedagogy, and critique of history as cultural texts. **Figure 1:** 'Problematised History Pedagogy as a System of Meaning and Dismantling Analysis' indicates the three research processes and indicators of

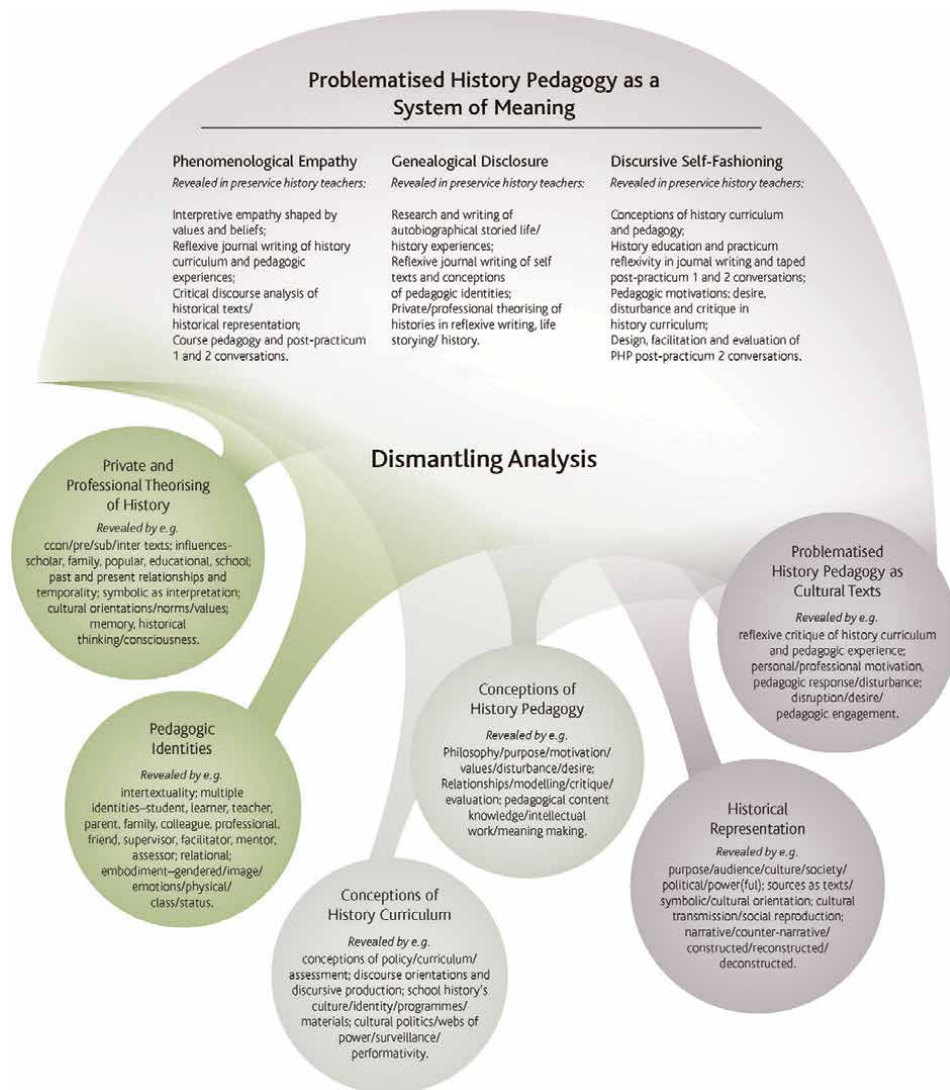


Figure 1. Problematised history pedagogy as a system of meaning and dismantling analysis.

participants' activities that generated evidence collection beyond their reflective journaling. Six themes are identified from the PHP system of meaning, and their indicators assisted data organisation, and the deconstruction and interpretation of participants' thinking and actions as pre-service history teachers. Interwoven themes were loosely identified as: Private and professional theorising of history; Pedagogic identities; Conceptions of history pedagogy; Conceptions of history curriculum; PHP as cultural texts; Historical representation.

The ethical challenges of embedding research within my history coursework required careful consideration in the research design. Halse and Honey [28] discuss the power politics that are in play with research. A key issue was that the PHP was embedded in my year's history course, and identity positioning and conflicts of interest needed to be made clear and minimised wherever possible. The research ethics served as a cautionary reminder of the vulnerability of the pre-service history teachers and of my interpretive authority.

6. Participants PHP and emergent findings

The history class comprised ten pre-service teacher participants – eight women and two men mostly aged in their twenties with the exception of two women in their 30s, and a woman aged 51. One participant identified as Māori, and two participants identified biculturally as Māori and Pākeha. Seven class members identified as Pākeha or New Zealand European. All but two class members had experienced school history in their senior secondary years. Each participant brought a variety of history papers combined with social sciences or English papers to their degree qualification/s. Three participants had knowledge of research methods of history, and only five had explored political or cultural aspects of Aotearoa New Zealand histories. The participants' research processes were produced within planned and identifiable history education contexts, and a collective sense of purpose. However, the PHP did not seek uniform conceptions of self, history thinking, or pedagogy. In my narrative research I attempted to evoke something of the participants' selves and dispositions as heartbeats pulsed underneath the PHP research processes. This was textured through my professional knowledge of each individual formed through class pedagogy, practicum observations, dialogue, and the relationships we formed. Aspects of emergent PHP findings are discussed as follows in relation to participants' Private history theorising; Pedagogic identities; Threshold experiences with school history curriculum and pedagogy; Public and accountable discursive practice. Participants' visibility is included here through glimpses of their voices as evidenced by texts generated by the PHP research processes.

6.1 Private history theorising

Participants' genealogical disclosure evidenced in reflective journal writing and autobiographical life-storying generally conceptualised history as living in the past. A discourse of connectedness to the lived experience of the past dominated the class' historical thinking. Family traditions, heritages of shared values through myths, folklore, stories of heroic deeds, and links to ancestors recollected cultural experiences, values and temporality. A strong discourse of memory and nostalgia permeated participants thinking about connectedness to lived experience. 'Nostalgia's' meaning derives from the Greek *nostos* (returning home) and *algia* (pain or distress). This embraces feelings about a disappearing past, temporal dislocation, imagined places and anxiety about change. Max and Jude, the two youngest class members described their families as typical white middle class families. Their

self-storying reveals nostalgic discourse. For Max, childhood and life events were recounted through “the heavy filter of memories ...as the mind’s projection unit.” An uncomplicated childhood full of talking animal stories as in Kenneth Grahame’s *Wind in the Willows*, and Joel Chandler Griffiths’ *Uncle Remus* stories was evoked. An idealised childhood complete with Grandfathers whose “glory days had come and gone during World War 2” was reimagined ([3], p. 147). Jude’s life-storying was informed by her interest in film representations of history and was accompanied by a DVD slideshow of arresting images. One image stirs memories of a New Zealand summer holiday in the mid-1980s: a campsite by a bay; dinghies beached on the shore; and Combi vans tucked into the shadow of bush-covered hills. A woman [grandmother?] is walking away from the photographer along a track between Pohutukawa trees and water. Her back is straight and strong, and she carries a young child in each arm with comfortable balance. One child looks forward, and the other child looks backwards. Jude chose to place this image at the end of her life history narrative. Whilst keeping the reader wondering, the image suggests Jude’s strong sense of family, her nostalgic view of the past, of moving into the future, and of the landscapes that move her ([3], p. 147).

Participants reflected their phenomenological empathy and values and beliefs about history through reflective journal entries in class, critical discourse analysis of self-selected history text, and conversations. History was commonly conceptualised as a discourse of history as lived outside the past – meaning history’s external representation through the voices of observers and interpreters living outside the past. Marie, who had worked as a museum educator prior to entering secondary teacher education, had a professional and critical awareness of ways historical experiences are represented in the present. Marie wrote about her visit to the United States Holocaust Memorial Museum in Washington DC to indicate her values and beliefs about history.

Marie’s Visit to the Holocaust Museum, Washington.

“I set out one morning for the Holocaust museum. We were lined up outside to go individually through the bag and weapon check, with even our water bottles inspected for potential poisons. Then it was up in an elevator to the top floor to begin the exhibition.”

“As a museum professional I am always looking at the text and labels, checking for display ideas, use of font and graphics etc., so spent considerable time on the first floor in the introductory stage of the exhibition, and was surrounded by classes of secondary school children. As I made my way down the exhibition levels, I grew increasingly depressed at the story being told. I already knew what happened in the Holocaust but to see footage of Jews having lobotomies whilst they were awake, the metal bins filled with parts of bodies—I thought I was going to throw up in the room. The school students were crying, and then we turned a corner and were faced with the hundreds of shoes left by those who had been sent to the gas chambers. It was the most effective and disturbing museum I have ever been to and I still get flashbacks to the film footage and feel a wave of nausea. My uncle who I was staying with in Washington is Polish and had managed to get out of Poland during the War. [He] was very upset that I had gone to the museum. He said it was in the past and it should stay buried, and why do young people want to see such things. I could not really answer him after seeing it.”

Marie’s encounter with Holocaust history brought moral and ethical issues, and history’s representation and purpose in contemporary contexts into sharp relief. The DA uncovered the tensions and difficult moments Marie negotiated

between her professional role as a museum educator, and her uncertainties about re-imagining and re-storying history in contemporary society ([3], p. 156). John's view of history as "uncertain, dependent on interpretation, and individual perceptions" offered a space for a more critical interrogation of historical contexts, and the historian's motives ([3], p. 152). Ana understood history as socially constructed, and culturally reproduced. She described history as "the multiplicity of the past and present—a fractured multi-faceted discourse" and viewed ideas and concepts that shape the investigative historian's perceptions as "no less pervasive than the ideas and concepts behind any historical context." ([3], p. 156). In Jude's life-storying, she articulated the work of history in this expansive conception:

"History is an area of life that increases understanding of human nature and the world around us. It allows us to know what events, ways of life, people and landscapes there were in the world. It also inspires and creates human emotion and empathy, encourages use of imagination, and interaction with others to express understandings and perspectives." ([3], p. 158).

All participants expressed certainties about their abilities to interpret historical perspectives as observers living outside the past, and to judge experiences of the past in light of their own values and perspectives. They presented their understandings of interpretive and perspectival thinking with an assuredness about their historical abilities and knowledge to judge others past experiences. However, only three participants had studied any aspect of Aotearoa New Zealand histories and experienced something of history research methods. A discourse of uncertainty in relation to participants' historical knowledge was evident in their feelings of doubt and discomfort with the affective force of 'difficult knowledge'.

6.2 Pedagogic identities as pre-service teachers

Participants' journal reflections prior to their first practicum revealed pedagogic identities and voices. Max's discourse about shaping a teacher identity was influenced by history teachers he had revered as "people of substance, wisdom, insight, and maturity" ([3], p. 164). Marie invoked her identities and roles as a museum educator, international traveller, observer, employee and student to illustrate her scholarly discourse and high expectations of selves. Val's sensitivity about body image, and her fears of colleagues' perceptions were at odds with her outwards confidence and expressive voice. As the May school practicum edged closer, class members revealed pedagogic identities. A powerful discourse of embodiment was expressed as feelings of fear, failure and fraud in relation to becoming history teachers and not meeting colleagues' professional expectations. Vulnerability and eccentricity were glimpsed in their embodied teaching selves. Maya emphatically reflected: "Then it's practicum for six weeks! I don't want to go! I don't want to go! I DON'T WANT TO GO!!!! I am feeling anxious, nervous, petrified, and generally just scared" ([3], p. 165). A fear of not knowing and feeling like a fraud as a teacher proved a compelling discourse. John experienced panic attacks about not being interesting or effective. Ruth was fearful of not being a successful history teacher. Rosa worried about dealing with disruptive junior students. She feared judgement about "any failure to instill strict discipline over what are problematic classes ... my mission is to steel myself to cope with teaching them." ([3], p. 166). Ways that sense is made of history as teachers and learners have a powerful effect, because our ways of knowing are negotiated through embodied identities and relations. Class members' thinking about teaching history was shaped by experiences of school history's discursive production and ways of doing, being, and valuing. School history might

be conceptualised as a site of cultural politics in education where hegemonic structures favour desired qualities and material practices over others. The underbelly or often hidden side of education was exposed by the participants' discourses of embodiment. Uncertainty about pedagogic selves, identities and history knowledge was filtered through participants' lenses of educational experience.

6.3 Threshold experiences with school history curriculum and pedagogy

The participants experienced their first practicum experience after three months of class work and PHP research processes. Curriculum discourses in our class work and practicum preparation presented entry points for understanding school history. Participants' phenomenological (interpretive) empathy and self-fashioning in relation to history curriculum and pedagogy was elicited through their journal writing and post practicum conversations. Glimpses of threshold experiences of history curriculum and pedagogy are shared as follows. History's curriculum purpose was not questioned during pedagogic approaches participants experienced whilst on practicum. History pedagogy was experienced as an exclusive citizenship orientation, a kind of unquestioned and unconscious narrative of nationalism and national identity discourse. However the concept of 'citizenship' was not referred to as such.

Whilst the discourse of fears, fraud, and failure seemed to go underground as participants settled into practicum, their narratives reveal resilience as they came to grips with colleagues' expectations and approaches. The wanting to fit in and to be taken seriously meant most participants were reluctant to seek guidance, ask questions about where to find resources and access information, or reveal they had no knowledge of contexts they were teaching. The participants' shift from a focus on teaching selves to viewing history students as learners, and thinking about history pedagogy as relational pedagogy, was evident in journal reflections and post practicum conversations. Marie reflected on her attempt to bring some meaning to the context of New Zealand's political leadership by working with skills of historical empathy.

"And so I wanted to use historical imagination. They had to produce a brochure for the 1972 election and imagine themselves as Norman and say where they are going to take this country and why we are going to vote for him. I thought it was an interesting thing to do BUT a lot of the students including the brighter ones would go: I'd rather just write notes Miss, can't you just put it on the board? Why do we have to do this?" ([3], p. 183).

Participants (Ana, John, Adele, and Marie) questioned learners' inquiry of specific events-based information of an historical context, when there appeared to be limited engagement with or understanding of human agency, wider social forces and movements, or unpacking of concepts and ideas. John reflected that the Russian Revolution history he taught on practicum was focused on knowledge transmission to pass an NCEA externally assessed examination:

"I wanted to develop their appreciation, their knowledge of history. I don't even know if it was the NCEA's fault, or just the way the school did deal with NCEA. But to me it was all driven towards achieving the credits and not about appreciating the subject" ([3], p. 184).

Marie and John evaluated the historical contexts they worked with as difficult for students to make sense of in light of their ages and life experiences. John reflected on the relevance of the Russian Revolution for his students.

“I do suspect they enjoyed it but I think the context would have been most challenging, just trying to work out why things occurred, and how that was particularly relevant. Just, how things have developed today, it would have been a different situation if it happened now: and just trying to link that back to the past and work out why the Tsarist regime behaved the way it did: the whole divine right of Kings and all that kind of stuff, and just the whole different political structure I guess. Trying to understand and get a feeling for the situation at the time would be the most challenging for them” ([3], p. 184).

Most participants supported a need to understand New Zealand histories through bicultural lenses. Whilst this was not their experience of the history curriculum, it was their hope for things to come. Ruth was intensely affected by colleagues’ cursory approaches towards or disinterest in New Zealand’s history.

“I often hear that New Zealand history is boring. I hate it when people say [mimics voices in a dramatic whisper]: ‘Oh why are you doing New Zealand history? It doesn’t have much history, it is only a young country’. Stop patronising! I usually say: “Do you know anything about New Zealand history? It doesn’t sound like you do!” ([3], p. 185).

Val and Jude were disturbed by the overtly male-centred nature of history programmes they encountered through ‘sacred’ topic preferences and the dated authorship and sexist nature of many history resources. Val reflected on her associate teacher’s approach:

“Being a boys’ school, they really responded to it because they could easily get him off track by asking about guns and tanks and stuff. It was a really positive experience for them and the boys really enjoyed history, because he knew a lot about what they wanted to know about. That’s where I felt I was failing. My weakness as a history teacher is that I have no interest or knowledge in the sorts of history that boys care about” ([3], p. 186)

Jude and Val observed that women’s historical representation was generally addressed as an afterthought. They questioned the conflict-oriented contexts that both young men and women seemed to enjoy. Val reflected on the importance of young men having ‘ownership’ of historical knowledge, but saw this as compromised if historical knowledge was one-sided. Jude reflected: “History cannot be taught effectively if the learners have warped ideas of it and are therefore confused and biased to begin with” ([3] p. 189). They attempted to introduce aspects of women’s historical experience into the topics they taught as purposeful and ‘culturally just’ learning.

Participants recounted their relationships with history colleagues when thoughts were shared about ‘fitting in’ with associates’ pedagogies. Val felt a sense of “guilt and shame about not putting the hours of prep in as her peers.” She perceived her weaknesses and she longed for positive mentoring and constructive feedback rather than ambiguous comment:

“I had a really good lesson with them and I said to my associate “that was a good lesson.” She said, “you reckon!” But she said it in a ‘loving’ (not hostile) way because I had built up too much into being a yelly person and her method of teaching is not that”. ([3], p. 187).

Ana, who saw herself as an advocate for students, found aspects of her history associate's pedagogic relationships at odds with her vision of pedagogy.

“He’s very passionate about whatever he is doing, and he definitely has a love of it. He has such a huge knowledge base and I think there are certain students that connect with that. But it is very obvious that if you don’t fit his mould of an accepted person, they’re actually wiped quite succinctly, clearly, and labeled” ([3], p. 187).

Inside their threshold experience of school history, participants observed the intended, implemented, and outcomes-based history curriculum largely as substantive reproduction of events-based facts. Few engaged with, or initiated pedagogy that questioned learning outcomes or students' passivity and disengagement in classrooms. A recurrent discourse articulated their impressions of teachers' contextual choices as conflict-based and violent. Participants' reflexivity revealed their rapid socialisation into discourses of teacher professionalism that I am also positioned within. Professional loyalty meant caution in not voicing overt criticism. Loyalty towards their practicum schools and colleagues was evident in the respectful and considered way participants recounted their experiences. Silence might be interpreted in the discourse of teacher professionalism as a shared understanding of what was known, but could not be voiced.

As a follow up to the first practicum experience, participants completed a Critical Discourse Analysis (CDA) of self-selected history textual material commonly used in school history programmes. As a PHP research process, I wanted to engage participants in thinking about how texts construct representations of history and the past, identities and historical relationships, and authority and control. Dismantling analysis of the participants' CDA revealed that half the class had no prior experience of textual analysis. Whilst participants could identify historical contexts and settings, narrative purpose, and curriculum connections with ease, the identification and analysis of discourses, dominant themes and ideas proved a new and challenging interpretive process for half the class. John's social reconstructionist curriculum orientation opened a space to reflect on counter-narratives of stories not told, contingency, and human dilemmas. Max's CDA revealed an awareness of meta-narratives and omissions in historical accounts. Ana's CDA noted: “The realisation of the ease with which a history can be reinterpreted, and re-constructed through further analysis, exemplifies the interpretive nature of history, the historical process, and the multiplicity inherent in the past.” ([3], p. 203). Max, became absorbed in his CDA, and he wrote with passion about the discursive practice of history as written by the victors, and stated:

“We still give texts such as this to our history students: Where are the ordinary people?”

“According to the text they aren’t important enough to talk about, even collectively! History from the top down – politicians, war-mongers, politics, wars, countries and national desires, conquests and losses. Perhaps the authors are constructing a nice sanitised version of the events leading up to WW2, as if to demonstrate that these “important dates”, places, and people they discuss, are agents somehow able to act in isolation from the peoples they represent. Common people do not make history in other words” ([3], p. 205).

Adele was disappointed with the limited cultural perspectives and misplaced gendered assumptions in her selected text where generic characters were prescribed by the author's descriptions:

“There is also an assumption in this text that all men were against prohibition and all women for it. Perspectives that should also be examined are those of women who were opposed to suffrage, and men who supported it, as these were important gendered perspectives in the suffrage debate. The author only allows two reasons that men were opposed to suffrage – social status or lack of capacity. This is a Eurocentric exemplar that suggests Maori were not concerned with issues of suffrage. As all Maori men over the age of 21 [could] vote from 1867, it would follow that all Maori would have a stake in the suffrage movement too” ([3], p. 205).

Ana had worked with her selected text with her first practicum class. She perceived that opportunities for stimulating and challenging students’ historical thinking with the ‘quality’ text were not explored:

“[The author] organised and structured this text in a manner that required further active pedagogical engagement than that witnessed. Many students displayed an insightfulness that reflected the qualities of this text and their own level of intellect, rather than the success of the pedagogical style of the teacher” ([3], p. 206).

Few participants felt confident in engaging with historical research methods or analytical skills processes, to uncover and interpret evidence. Interestingly, none of the participants questioned the nature of or the historical purpose of the historical contexts that their texts represented.

6.4 PHP as public and accountable discursive practice

Participants’ discursive self-fashioning was revealed through their conceptions of school history curriculum and their pedagogic desire, disturbance and critique. They designed, facilitated and evaluated their own sequences of PHP within a history class in the second practicum. Their PHP cases as a research process drew on their observations and reflections of an aspect of history pedagogy that disturbed them. Participants’ PHP revealed pedagogic voices, identities and relationships in the enacted school history curriculum. **Table 1.** Participants’ Pedagogic Disturbance and Decisions to Problematise History Pedagogy provides an overview of the PHP decisions designed for implementation within associate teachers’ history classrooms. The problematising contexts mirror my experiences of the history curriculum in its promotion of a Eurocentric male-focused canon of topic contexts. However, these contexts were not the participants’ choice, and they were fortunate to implement teaching experience within schools’ history programmes. Participants’ accounts of their students’ responses to the history curriculum exposed a disturbing picture of student disengagement. Consequently, most of the PHP decisions attempted to mediate this situation by building supportive relationships with students. Whilst the purpose of history programmes did not seem apparent to learners, the authority and perceived threat of the NCEA history assessment hung over them (reflected by all participants). The PHP ‘cases’ as storied into my wider narrative research [3] indicated history students’ disengagement and confusion with their history learning.

PHP cases exposed history students impressions that history is mostly about note-taking and information about events, cause, effect and consequences, and essay writing – a skill they found demanding and difficult (Adele, Max, Marie, Val, Ana). Concerns about students’ literacy skills were apparent in participants’ decisions to focus on conceptual understandings, revision processes/making sense of information, supporting learning needs, and their rejection of transmissive approaches. The DA of the PHP cases indicates participants’ thinking about their responsibilities as

Participants	Curriculum Disturbance	Problematised History Pedagogy
John	Year 11 students' perceptions of the actions of/ historical significance of <i>Black Civil Rights leaders USA 1960s</i>	Introduced counter-narratives to engage students in thinking about moral and ethical issues re protest and conflicting positions
Adele	Year 12 students' limited contextual and conceptual understandings re. <i>Conflict in Indo-China/Vietnam 1945–1970s</i>	Intensive focus on ideas, e.g. <i>nationalism</i> and <i>identity</i> to support essay writing skills
Val	Year 12 'unwilling' students' limited understandings of/organisation/information re the <i>Irish history</i> topic	Established reasons to be learning about history: Essay writing skills and ascertaining students' conceptual understandings
Maya	Year 11 students' 'disinterest' in history – <i>World War 2</i> topic	Focusing students on the relevance of history, and exploring perspectives and viewpoints
Marie	Year 13 students' 'unproductive' independent learning re. <i>Early Modern English history 1558–1665</i>	Surveying students' strengths and weaknesses re history context (knowledge/skills processes/ preferred pedagogy). Provision of informed pedagogy
Ruth	Year 11 students' limited engagement with human agency/motivations and historical empathy re. <i>Irish republican movement 1916–1919</i>	Facilitated activities for students to embody the history they were revising – historical imagination and empathy
Max	Year 11 students discussion sessions re. <i>Black Civil Rights 1950s–1970</i> . Discovery that a group of fearful students was dislocated from the class pedagogy	Activated strategies to observe students' engagement in pedagogy and elicit students' responses re historical understandings
Jude	Year 10 students confusion with connections between random 20th century revolutionary contexts and WW2; Year 11 students boredom with <i>Black Civil Rights 1950s–1970</i> history	Contextualised Hitler's leadership and Nazism within a framework of documentary evidence; Focus on womens' historical experiences and representation
Ana	Year 12 students' passive engagement with historical texts re. <i>Vietnamese nationalism 1945–1975</i>	Facilitated textual analysis and interrogation to stimulate critical thinking.
Rosa	Did not undertake this research process due to personal circumstances.	

Table 1. Participants' pedagogic disturbance and decisions to problematise history pedagogy.

beginning history teachers, and something of their responses to, and reimagining's of history pedagogy in the school curriculum. The participants' PHP advanced critique into public spaces of curriculum and assessment policies. Whilst PHP was possible, it was activated within class programmes that embedded teachers' values and topic preferences, standards' interpretation, and the use of traditional texts. Despite these constraints, participants acted on their situated disturbance to engage students in pedagogy that was generated as something different. The PHP decisions might be perceived as the practice that teachers and students need to engage with every day, rather than as critical practice. However, the PHP did prompt critique of normalised discourses, exclusive knowledge claims and pedagogic assumptions. Participants reflected on the dominant orientation of school history as a form of inquiry whereby information gathering involved transmission of prevailing knowledge claims. This orientation reflects curriculum and assessment positioning as the

public and accountable approach to school history. This was viewed as problematic in terms of reproduction of exclusive and normative thinking. Likewise the orientation of history as shaping and connections was viewed as problematic in relation to nostalgic memory work, unquestioned national narratives, exclusive citizenship and knowledge claims. Glimpses of three reimagined counter orientations were reflected as history as democratic and inclusive (Val, Max, Marie, Ruth) history as social reconstruction (John), and history as a critical project (Ana).

Participants expressed the desire to be 'switched on' teachers. This was generally seen as being informed, active, purposeful, observant, dialogic, and inclusive. The participants' PHP cases are storied in my wider narrative research, and present rich evidence of pre-service teachers' motivations to engage with history learners. With a sense of being a 'subversive teacher' John designed his PHP to go beyond topic constraints and he focused on ways students perceived the historical significance of the civil rights leaders Martin Luther King, and Malcolm X. In evaluating his PHP, John reflected on moral and ethical issues raised in conflict-focused historical contexts:

"Yeah, parts of it worked, parts didn't. They were still keen on the violence, and I don't know if that's really because of the two leaders, or just because nowadays kids are into violence and people dying, and war games and that sort of stuff. But when you try and wind it back to the curriculum and the material that you are going to teach, it's the people dying that gets them going!!! Whereas the whole values and the reasons behind them, the philosophies and all that kind of stuff, it bores them. I found dealing with that was kind of hard. Because my focus was on Martin Luther King and Malcolm X, I wanted the kids to have a broader understanding of the cost of violence" ([3], p. 210-211)

Whilst John enabled his students to form their own opinions and think of different perspectives, he reflected on his PHP motivations to question whether he was being a subversive teacher or a teacher pushing his agenda. Ana's PHP involved textual analysis as informed by her CDA. She expressed a clear purpose for her PHP that "all text/sources can be open to question and critique, and should therefore not be consumed passively as orthodox and authoritative" and further reflected:

"I believe that only through the active engagement with text, its deconstruction, evaluation, and analysis can students gain the history skills necessary to successfully critique and evaluate the historical information, perspective and bias inherent in any text. This skill is an absolute necessity for the comprehension and understanding of the multiplicity of history in the past, and in essence the diversity of the wider world today. The gaining of this skill therefore becomes a practical and relevant tool for students studying the past, engaging with the past, and goes some way to justifying the relevance of the discipline of history itself" ([3], p. 218).

7. A continuity of problematised history pedagogy in ITE

The PHP research has proved invaluable for my ongoing work in postgraduate teacher education. Emergent findings revealed participants' reflexivity, and exposed gaps and weaknesses, certainties and uncertainties in conceptions of school history and historical thinking. As a consequence, I deliberately plan for and address the following elements of history education with pre-service teachers, and embed these within my course objectives and assignment work:

- Making explicit the constructed narrative nature of history and focusing on historical representation through a range of media including digital sources;
- Active deconstruction of historical texts (visual, audio, written, performance ...);
- Questioning uncritical and normative approaches to perspectives' thinking and interpretation in pedagogy;
- Countering tentative and apologetic approaches to inclusion of gendered and cultural historical agency and experience;
- Identifying discursive and disciplinary orientations to history;
- Modelling pedagogy that critiques the purpose of history for secondary students;
- Identification of exclusive notions of citizenship, and finding ways to understand, confront, and become informed about 'difficult knowledge'.

Two assignments in my history course work have evolved from the PHP findings and embed critical approaches to pedagogy. One is an E-Portfolio of scholarly research of an unfamiliar Aotearoa historical context relevant to senior history students' interests. This involves pre-service history teachers in understanding and reflecting engagement with the pedagogic elements listed above. The second assignment involves the research and writing of an article for a history teaching audience that reports on pedagogic disturbance and PHP activated with history students as evidence-based practice.

The PHP findings inform critique of ways history is conceptualised in the national curriculum, and the national history curriculum history achievement objectives' alignments (since 2007) with the national qualifications framework's history assessment standards [13, 14]. In September 2019, the Government announced plans to teach New Zealand history in all schools and kura by 2022 <http://www.beehive.govt.nz>. There is public interest in finding out about Māori history as the continuous foundation of Aotearoa New Zealand histories. This policy initiative might be seen as a response to prevailing colonial and racist attitudes in New Zealand society, forces of decolonisation, and increasing social diversity. Inclusive educational principles and citizenship visions are focusing on learners' identities, belonging and participation. Following the heinous massacre of Muslim New Zealanders at prayer in Christchurch in 2019, The Teaching Council of Aotearoa New Zealand commented: "Racial prejudice and intolerance lives in our everyday. In New Zealand, racism is woven into the fabric of society. It lives in our everyday systems, structures, statistics, and assumptions" (25 March, 2019). <https://www.govt.nz/organisations/teaching-council-of-aotearoa-new-zealand/>

The emergent research findings have implications for ways students as young citizens receive and understand history in the schooling curriculum. Students' interest in and selection of history as a subject requires investment and innovation in approach. Years 11–13 students' voicing of fears and confusion in relation to their history learning deserves critical attention. Normalised reproduction of topic preferences, often conflict based and centered on men's historical experience needs to be questioned in light of perpetuating inequalities and injustice. The PHP highlighted a prevalent view of history teachers that anything different or cultural or social in the history curriculum is an aberration, and likely to be

rejected. The PHP findings are situated in my pedagogy and in a particular group of schools. I cannot claim that the findings are representative of all schooling sites.

8. Closing thoughts

My motivation for writing this chapter is informed by observations of senior history students who generally experience historical inquiry as disconnected from their embodied lifeworlds, cultural values and experiences. This also increasingly applies to pre-service history teachers as they negotiate the cultural politics of the history curriculum – often without knowledge of Aotearoa New Zealand histories, or conceptions of the nature and purpose of history education. An introduction to the contemporary context of Aotearoa New Zealand society sets the scene for a discussion of young people's lived citizenships as fluid crossings of identities, and diverse cultures including cyber, popular, social media, and real and imagined spaces of belonging. My positioning as a teacher educator of social sciences and history is introduced in light of complex crossings of professional, academic, public, pedagogic and policy sites of history where discursive production noisily jostles to cast an unstable and contested shape of school history. Curriculum and policy disturbance is recounted because this activated my resistance to history policy decision-making, and moved me to focus research on my history work in teacher education. The conceptualisation of teaching selves, a theorising of history, and description of dimensions of pedagogy present a foundation for my shift to a critical pedagogy stance. PHP research designed as a reciprocal system of meaning layered within wider narrative research is outlined, along with a description of a Dismantling Analysis (DA) that sought to unravel and interpret the symbolic mantle of the cultural politics and power relations of school history. Emergent findings of participants' PHP are presented within a commentary that brings voice and visibility to the participants' experiences of school history. A continuity of critical approaches to history pedagogy that has evolved from the PHP research identifies elements in course work for pre-service teachers' historical thinking.

As identity and belonging is an important element of lived citizenships, then young citizens need to see their pasts as valued and tangible in the histories of this place Aotearoa New Zealand, and its peoples. History education has a responsibility to make visible inclusive representations of the past, to counter normative narratives of certainty, and to expose exclusive notions of being a future-oriented citizen in Aotearoa New Zealand. Historians' skills and motivations to identify alternative paths and experiences through their narratives, and to be open to critique power(ful) practices and dominant worldviews, deserve attention in history education. Historians might help us see the past as a provocation to view something of our selves in different ways. Dialogue is needed between history researchers and practitioners in teacher education, schools and the academy, to enable young citizens of Aotearoa New Zealand to affirm identities and access lived experiences of the past. They need to be part of the histories of the present, and to see themselves in history.

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Teacher education is an increasingly complex and challenging area of research and practice ultimately vital for generations. This book imparts insight and directions for both research and practice in teacher education. Chapters cover a variety of topics, such as collaborative teaching experiences, creativity education in curricula, innovations in science and technology in education, new techniques for learning and teaching subjects such as entrepreneurship, history, mathematics, science, technology, heritage, and early childhood education, and using online social platforms in education.

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