The Editorial board welcomes this issue of the Journal of Teacher Education for Sustainability, which consists of the papers that deal with very important issues within education for sustainable development: paradigmatic frameworks to guide educators in assessing sustainability competencies, digital citizenship in the afterschool space and its implications for education for sustainable development (ESD), the environmental knowledge and attitudes and ESD and many others. I would like to thank all the members of the Editorial board for their hard work. My thanks are also due to the authors of the papers.

The paper by Besong and Holland focuses on the concepts of sustainability and sustainability competence, which are controversial, complex, difficult to define and measure and have varied meanings for different people and practices. Given the complex nature of sustainability, there is limited availability of paradigmatic frameworks to guide educators in assessing sustainability competencies. The paper introduces the Dispositions, Abilities and Behaviours (DAB) framework, which influenced the design of an intervention in 2013–2014 that profiled sustainability competencies among final year undergraduate students in a higher education institution. The results of the mixed methods study indicate that the DAB framework has good potential as a guide to educators or researchers in understanding and profiling sustainability-related abilities, attitudes and actions (areas of performance) of cohorts of students within higher education settings.

The paper by Howard accentuates that ESD challenges traditional curricula and formal schooling in important ways. ESD requires systemic thinking, interdisciplinarity and is strengthened through the contributions of all disciplines. As with any transformative societal and technological shift, new questions arise when educators are required to venture into unchartered waters. Research has led to some interesting findings concerning digital literacies in the K-12 classroom. One finding is that a great deal of digital media learning is happening outside the traditional classroom space and is taking place in the afterschool space. Understanding the nature of learning in the afterschool space and bridging the current divide between formal schooling and the learning happening online is critical to the establishment of core ESD values and skills, namely ethical online communities and the development of respectful, tolerant global digital citizens.

The paper by Geng and her colleagues investigates stress levels of pre-service teachers (PSTs) across three categories of teaching context: early childhood, primary and secondary. This paper focuses on exploring the stressors in the completion of tasks in teaching practicum in the three categories of teaching context and an awareness of and access to support systems. The Perceived Stress Scale (PSS) and an online questionnaire were used to measure the nature and level of stress. Significant results were found in relation to the school climate and the stress levels of PSTs across the three different teaching contexts. These findings have implications in terms of understanding different PSTs’ stress levels across the three teaching contexts and ways they could be supported to reduce their stress level and achieve better study outcomes.

The paper by Mifsud and Verret assesses the environmental knowledge and attitudes of the Maltese public towards the local marine environment, marine protected areas
(MPAs) and ESD. A questionnaire was administered to members of the public at three different locations. The study found that although the Maltese public strongly appreciates the beauty of Malta’s marine environment, the level of knowledge surrounding the marine environment is low. Furthermore, the research indicates that while the public agrees that the marine environment should be protected, there is a notable lack of awareness of the five local MPAs. Based on the research findings, a model linking ESD to MPAs and aiming to foster a sense of ownership among the public by encouraging their involvement in the management of local MPAs is proposed.

The paper by Kolbe concentrates on well-organised waste management, which is an essential part of sustainable development. The saving of resources and energy is everyone’s concern and environmental education is vital to guarantee a sustainable lifestyle in the long run. To find out what similarities and differences in views regarding waste management exist between grammar school pupils and comprehensive school pupils in England, questionnaires were designed and distributed in two schools in the same English city. The questionnaires aimed at quantifying and establishing students’ knowledge, attitudes and behaviour regarding waste management. The results illustrate that students from the grammar school had higher levels of knowledge, were more likely to recycle and used more sources of information regarding waste management. Waste reduction was considered important by almost all students. However, students in both schools considered composting and waste reduction as less important than recycling and thereby did not fully agree with sustainable waste management.

The paper by Álvarez-García and his colleagues examines the existing evidence from studies evaluating and analysing the relationship between environmental education, including environmental competences and pre-service primary school teacher training. The literature review performed included 24 documents (22 peer reviewed journal articles and two doctoral theses). The strategy followed consisted in locating documents by a reliable search strategy; establishing the criteria for the selection of documents to analyse from the documents located and rigorously analysing the documents selected based on clear and precise criteria and dimensions. In general terms, the literature review analysis has emphasised the lack of environmental competences amongst pre-service teacher students and the gaps in the teacher training curriculums regarding environmental education. The overall scarcity of research in this area affirms the need for strengthening the evidence base.

The paper by Ortega and Fuentes states that research on teacher training often focuses on learners’ perceptions of that training. The focus of this paper, which uses a research-to-practice approach, is instead on the views of the trainers. It evaluates the perceptions of university lecturers teaching classes as part of primary teachers’ training degrees and assesses their views of the communication skills developed by their students to be used in their future careers. The study uses a 17-item ad-hoc questionnaire, completed by 152 lecturers from the University of Granada. Descriptive and inferential analyses are then carried out on the data collected using SPSS. The analysis results show how important lecturers believe it is for trainee teachers to develop communication skills, which they often lack. Although lecturers believe communication skills are very important, they also think that they are not developed as much as they should be in their classes, so trainee teachers cannot communicate as effectively as they should.

The paper by Nurmilaakso acknowledges that, over the last decades, the nature and form of what children can choose to read has changed radically, partly as a con-
sequence of rapid technological advances and the increasing dominance of the image, and focuses on how children can support their learning to write and read by computer in the early years of school.

Finally, Patrick Howard – the author of one of the papers published in this issue of the Journal of Teacher Education for Sustainability – wrote about his photo titled “Nurse Log”, which is the cover photo of the printed journal, “It inspires me to think about the perfect closed system, the fallen tree provides a complex and dynamic ecological niche for growth and re-generation. May we find more ways to mimic nature in this perfect, closed loop of sustainability!”

Editor-in-chief
Dr Astrida Skrinda
Abstract

The concepts of sustainability and sustainability competence are controversial, complex, difficult to define and measure, and have varied meanings for different people and practices. Given the complex nature of sustainability, there is limited availability of paradigmatic frameworks to guide educators in assessing sustainability competencies. This paper introduces the Dispositions, Abilities and Behaviours (DAB) framework, which influenced the design of an intervention in 2013–2014 that profiled sustainability competencies among final year undergraduate students in a higher education institution. The results of the mixed methods study indicate that the DAB framework has good potential as a guide to educators or researchers in understanding and profiling sustainability-related abilities, attitudes and actions (areas of performance) of cohorts of students within higher education settings.

Keywords: higher education, sustainability, sustainability competencies, dispositions, abilities, behaviours

Profiling Sustainability Competencies

The purpose of integrating sustainability in higher education programmes is to enable students to improve the quality of life on this planet while building fair, equitable and just futures for all. To effectively do this, the knowledge, skills and dispositions of higher education students need to be re-oriented towards sustainability. Sustainability competencies are reflected in the way students make sense of our complex world, through their attitudes, aptitudes and behaviours in relation to sustainability; and ultimately in the extent to which they can transform themselves and society to become more sustainable. The purpose of this study was to devise and pilot a tool that could be used to profile sustainability competencies across a cohort of students in a higher education context. It is important to note that the remit of this study did not extend to uncovering reasons as to why certain dispositions, abilities or behaviours towards sustainability were present or absent, but rather to create a tool capable of generating a profile of learners’ competencies at a particular point in time. The premise was that, if such a tool could be
developed, then it could be utilised in future studies to identify the extent to which the sustainability-profiles of cohorts of students change over time in particular programmes of study in higher education. This could be used by future researchers to identify courses successfully fostering education for sustainable development, and thus, to explore in detail the types of pedagogic processes and practices resulting in improved sustainability competencies across cohorts of students.

The Dispositions, Abilities and Behaviours (DAB) framework that emerged presents a snapshot of a cohort of students’ dispositions, abilities and behaviours vis-a-vis sustainability at a particular point in time. The discussion that ensues reports on the design, implementation and future developments with regards to the DAB framework. It begins by outlining the methodology for this pilot study, engages in a brief review of the literature on sustainability competencies, presents the DAB framework and ends with discussion of key findings from the study and implications for future research.

**Methodology**

This study used an explanatory mixed methods approach, which involved two phases of research to investigate the following questions:

1. What sustainability competencies can or should be assessed in higher education; and how should these competencies be framed?
2. Can students’ development of these sustainability competencies (knowledge, skills, attitudes and/ or behaviours) be effectively measured within higher education?

The first phase involved the conceptualisation and design of the DAB framework, through qualitative data emergent from critical review of the literature and discussions with researchers and experts in sustainability education (SE). The second phase made use of a quantitative instrument (an online survey designed using elements of the DAB framework) that allowed learners to record their own perceived levels of sustainability competencies. The mixed method research approach thus involved the use of both quantitative and qualitative data collection and analysing tools.

The evolution of the DAB framework was informed by a review of the literature and discussions with experts in the domain of SE. In this regard, the qualitative data from both the literature review and conversations with experts were coded and emergent themes informed the data analysis process, which eventually resulted in the framing of sustainability competencies in terms of learners’ dispositions, abilities and behaviours in sustainability (the DAB framework).

In terms of the quantitative dimension of this study, 37 students (out of a total of 95) in the final year of an undergraduate education programme in teacher education participated in an online survey modelled on the DAB framework. The majority of participants enrolled on the targeted degree course intended to qualify as primary-school teachers. There was a very high level of female participants within the course (circa 90% female), which was representative of the high proportion of females (85%) engaged in initial primary teacher education more generally in Ireland (Central Statistics Office, 2012, p. 12).

According to Joppe (2000), as cited in Golafshani (2003), reliability (the extent to which an instrument’s measurement results are consistent over time) and validity (the extent to which an instrument’s results consistently measure the construct of interest)
remain an important aspect of any research undertaking. Reliability and validity for this study were obtained through the use of the explanatory mixed methods approach. In this regard, the literature review on sustainability and sustainability competencies initially resulted in the authors’ conceptualisation and design of the DAB framework. This DAB framework was then subjected to critical review at a number of seminars and conferences by experts and researchers within the field of sustainability, which helped to inform revisions to its design and establish its validity as a possible guide to designing a tool for assessing sustainability competencies. Secondly, based on a critical examination of the elements of the DAB instrument and themes generated from literature on sustainability and sustainability competencies, a survey instrument of 49 statements/questions was designed to measure students’ sustainability competencies. The data generated from participants’ responses on the survey questionnaire were analysed to better understand the extent to which the survey could be used to effectively profile sustainability competencies. The survey data were thus statistically analysed using the Statistical Package for Social Sciences (SPSS), Version 21, using statistical frequencies and internal consistency tests to ascertain construct validity.

Finally a triangulation process was employed, which involved the “mixing” of both the quantitative and qualitative research data of the study to better understand the research problem (Creswell, 2012), providing a more “complete picture” (Greene, Caracelli, & Graham, 1989) and ascertaining the overall validity of the study.

**Sustainability in Focus**

In the review of the literature that follows, the key concepts and contexts of education for sustainable development (ESD) are examined, beginning with exploration of the concepts of ESD, and then focusing on the area of sustainability competencies.

**Sustainability**

The concept of sustainability remains controversial with no universally acceptable definition. Generally sustainability is conceived as the ability to maintain something for a long time at a specific rate or level. It is an undefined set of ideals which allow people and other living and non-living things to have dignity and satisfaction and for human actions to be geared towards protecting the environment, fostering societal justice, economic prosperity and equity and promoting cultural vitality and diversity.

The World Commission on Environment and Development (WCED) report, also called the Brundtland Report, “Our Common Future”, defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p. 43). Since then, sustainable development has become a global catch phrase giving rise to a widening of the discourse of the concept with many definitions (Mebratu, 1998). This study will focus on this UN definition of the concept, which is widely accepted globally. The UN definition of sustainable development focuses on intergenerational equity and implies that there are limits on the carrying capacity of the environment “to absorb the effects of human activities” (Kates, Parris, & Leiserowitz, 2005, p. 11). However, the concept of sustainable development remains heavily loaded with meanings and interpretations, vague and ambiguous, so much so that many scholars view the concept as an oxymoron – a
concept that remains “fundamentally contradictory and irreconcilable” (Kates et al., 2005, p. 20). In spite of the divergent definitions and criticisms, the concept of sustainable development is open to interpretations and adaptations to different socio-cultural, economic and ecological contexts.

Education for Sustainability

Education is crucial in fostering the ideals of sustainability. ESD is a process of learning how to make decisions that consider the long-term futures of the economy, ecology, the equitable development of all communities as well as the promotion of their cultures. ESD enables people to develop the knowledge, skills, values and competencies that promote sustainable actions and lead to improved quality of life now without destroying the environment for future generations. ESD provides individuals with the competencies to make judgements and choices towards more sustainable behaviours. People all over the world need the basic life necessities of employment, health, education, food, shelter and sanitation, which protects their quality of life. These necessities should be obtained while protecting and preserving the environment and ensuring that future generations will also have the opportunity to enjoy the same. The present global economic recession and the catastrophic impacts of climate change and other environmental hazards provide evidence of the unsustainable economic, financial and ecological actions of humanity. The impacts of such unsustainable human actions call for the need to promote a shift in human mindsets to embrace more sustainable values, behaviours and lifestyles which can make the world safer, healthier and more prosperous for all, thus improving both the environmental and human quality of life.

ESD is vital for human development. A vision of the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2006) of sustainability centres on developing a world where everyone has the opportunity to benefit from quality education and learn the values, behaviours and lifestyles required for a sustainable future and for positive societal transformation. ESD is thus a process of learning how to make decisions that consider the long-term effects of human actions on the environment, promoting diversity in cultures, values and beliefs, equitable and green economic development as well as societal justice.

SE is conceptualised as a holistic system with the four interconnected and interdependent components. These components: economy, society, culture and the environment are important in attaining sustainability. Any actions in one area have consequences on the other components be them positive or

Figure 1. The four corner stones of sustainability education (Bangerter, Greer, Harich, Krause, & Turner, 2014)
negative. According to Yencken & Wilkinson (2001), the goal is to attain a positive balance on all the four components.

In the context of this paper, the terms “education for sustainable development”, “sustainability education” and “education for sustainability” are considered to mean one and the same thing, and are used interchangeably.

**Sustainability Competencies**

The concept of competence is complex, difficult to define and measure and has varied meanings in different contexts and areas of practice (FitzGerald, Walsh, & McCutcheon, 2001; Levett-Jones, Gersbach, Arthur, & Roche, 2011; Pedersen, 2007; Stevenson, 1996; Watson, Stimpson, Topping, & Porock, 2002). The broader discourse of the concepts of competence and competency is beyond the scope of this paper, so this paper will focus on the concept of competence in relation to the practice of sustainability.

Gonczi (2002) argues that competency is inferred from performance and is not directly observable. Gonczi further explains that, while the activities an individual performs are observable, the attributes that underlie the performance are inferred. In this light, he argues that competency is the amalgamation of knowledge, skills, dispositions and values. Thus individuals’ performances of tasks and activities “rests on more general capacities such as reasoning and making judgements as well as specific knowledge and individuals’ dispositions” (Gonczi, 2002, p. 120). Therefore in viewing the concept of competence in this way, there is no dichotomy between specific competencies and key competencies, because the capacity to perform specific activities will always entail some combination of knowledge, skills and dispositions. This holistic and integrated approach is in line with the definition of sustainability competencies. In order to live sustainably, individuals need to develop capabilities to bring together a range of attributes, skills, knowledge, values and dispositions which promote sustainability actions in a given context.

In this light, Wiek (2010) defines sustainability competencies as “complexes of knowledge, skills, and attitudes that enable successful task performance and problem-solving with respect to real-world sustainability problems, challenges, and opportunities” (n.p.). In the same light, Mochizuki and Fadeeva (2010) argue that competence is what learners are able to do at the end of a learning activity.

Within this paper, learner sustainability competencies are posited as action oriented and encompass the ability to perform. This position aligns with UNESCO’s (1996) identified key competencies of education for the 21st century as presented in the Delors report “Learning: The Treasure Within”, which identifies four key competencies in education which include: learning to know, learning to do, learning to be and learning to live together. These key competencies of education have been adopted as important pillars of sustainability competencies. In addition, a fifth cluster of sustainability competencies has been identified in the UN report (Shaeffer, 2007) which includes the sustainability competence of ‘learning to transform oneself and society’. Together these five clusters of competencies encompass the five key sustainability competencies necessary for SE.
Measuring Sustainability Competencies

An important aspect of SE is to identify the types of competencies necessary for educating learners in sustainability. However, there are difficulties in the area of evaluating or measuring learners’ abilities and manifestations of acquired sustainability competencies, and this issue is the centrepiece of this study. Within existing literature in sustainability competencies, there are limited paradigmatic frameworks to guide educators in the process of evaluating the actual performances and/or manifestations of learners’ sustainability competencies. Therefore, this study involved the conceptualisation, design and use of a sustainability competencies framework called the DAB framework as a guide in the development of a tool to test or measure learners’ sustainability competencies in higher education. The development of this framework is needed to fill the paradigmatic vacuum, that is, the absence of a framework to guide educators in assessing learners’ acquisition of sustainability competencies in SE. The discussion now moves to describe the DAB framework.

The DAB Framework

As outlined earlier, this study examined two questions, the first of which is responded to here: What sustainability competencies can or should be assessed in higher education? and How should these competencies be framed? In this regard, the DAB framework of competencies emerged from the qualitative dimension of this pilot study. So, what does DAB mean?

The DAB framework refers to the dispositions, abilities and behaviours that learners’ exhibit in relation to sustainability.

The Dispositions refers to learners’ dispositions for sustainability and this includes: learners’ desires/willingness and motivations to engage with sustainability and learners’ attitudes, beliefs and value orientations in relation to sustainability. Learners’ dispositions for sustainability relate to their sustainability competencies in ‘Learning to be’ and ‘Learning to live together’ (UNESCO, 1996). Learners’ values-orientations, belief-systems and attitudes, influence their desires, motivations and willingness to engage with sustainability. The impact of worldviews on engagements with sustainability is vividly explained in Escobar’s (2001) arguments that communities actively construct their sociocultural worlds “through their laborious daily practices of being, knowing, and doing … even if in the midst of other forces.” (p. 153). Cultural constructs and contexts thus impact on learners’ desires and motivations to engage with sustainability.

The Abilities refers to learners’ abilities in sustainability, including learners’ skills, aptitudes and knowledge for action on sustainability. Learners’ abilities to engage with sustainability relate to their sustainability competencies in learning to know and to do (UNESCO, 1996), and this involves learners’ cognitive capabilities and skills to engage in thinking that reflects sustainability values. This involves learners’ development of cognitive capabilities for systemic thinking, strategic planning, critical reflection, values thinking and futures thinking for sustainability.

The Behaviours refers to learners’ behaviours in relation to sustainability. Learners’ behaviours to promote sustainability relates to their sustainability competencies in ‘learning to transform oneself and society’ (Shaheffer, 2007). This involves their manifestations of sustainability through the actual actions taken to embrace or foster sustainability, thus acting as change agents for sustainability.
The DAB framework (Figure 2) is thus a guide towards understanding the key areas in which sustainability competencies can be measured as explained below:

1. assessing learners’ dispositions with regard to sustainability (which involves the process of assessing whether learners’ values, attitudes and beliefs are oriented towards promoting sustainability values like promoting environmental health, social inclusion and justice, intercultural communication, acceptance and preservation of indigenous knowledge);

2. assessing learners’ abilities to foster sustainability (which includes assessing whether learners have acquired the requisite cognitive skills in systemic thinking, strategic planning, critical reflection, values thinking and futures thinking as well as skills, aptitudes and knowledge in sustainability);

3. Assessing learners’ behaviours in relation to sustainability (which includes assessing the actual actions carried out by learners to act as change agents for promoting sustainability).

Figure 2. Dispositions, Abilities and Behaviours (DAB) Framework

Assessing Learners’ Sustainability Competencies Using the DAB Framework

The second part of this study focused on exploring the question: Can students’ development of these sustainability competencies (knowledge, skills, attitudes and/or behaviours) be effectively measured within higher education? In this regard, the assessment of sustainability competencies was considered through the lens of the DAB framework, sustainability competencies (Learning to Know; Learning to Do; Learning to Be; Learning to Live Together and Learning to Transform Oneself and Society) and key sustainability thematic areas.

The DAB framework informed the design of an online survey, which took the form of a set of context specific sustainability-related statements or questions used to ascertain learners’ dispositions, abilities and actions in fostering sustainability. This online survey was designed in such a way that it addressed the four cornerstones of sustainability, as well as the five clusters of sustainability competencies (Learning to Know; Learning to Do; Learning to Be; Learning to Live Together and Learning to Transform Oneself and Society). The set of questions and statements were used by learners’ to record their perceived levels of sustainability competencies, and the data gathered were analysed in a process that involved mapping the cumulative attitudes, aptitudes (including skills
and knowledge) and behaviours identified within the DAB framework. Thus the following criteria were taken into account within the mapping process:

1. the level of learners’ agreements with and willingness to engage with sustainability issues/actions (mapping out learners’ dispositions – attitudes, beliefs and value orientations – in relation to sustainability);
2. the level of learners’ abilities to engage with sustainability issues/actions (mapping out learners’ aptitudes, skills and knowledge in sustainability);
3. the frequency of learners’ engagements in actions for sustainability (mapping out actual actions carried out by learners to promote sustainability – by acting as champions or agents of change for sustainability).

The pilot survey was tested initially in November 2013 with a small sample of nine students to ascertain any issues with phrasing of statements or questions and/or examine whether it could be completed within an appropriate time-frame. In light of this, a number of statements/questions were re-phrased and a number of questions deleted. The final version of the online survey of 49 questions was designed and structured into four areas examining the participants’ profile, dispositions in relation to sustainability, abilities in sustainability and behaviours. The online survey was deployed in March 2014 (using the online software tool – Surveymonkey) to 95 final year higher education students in a higher education institution. A sample of 37 students in total responded to the survey (response rate of 39%); their responses were collated using Surveymonkey, and the resultant data were then analysed using SPSS, version 21. The participants varied in gender, age, and types of study programmes. The gender breakdown of the 37 respondents was 84% (n = 34) female and 16% (n = 3) male. In terms of age, 70% were between 16 to 24 years and 30% were over 25 years. In relation to the study programmes, 16% of the participants were studying part time, and 84% were studying full time. In post-survey discussions, students cited the following reasons for non-participation in the survey: difficulties associated with meeting survey deadlines and assignment deadlines; lack of knowledge about the purpose of survey (which was in part due to low attendance at scheduled informational sessions on research study); pressures associated with being in their final year of study at university and a lack of interest for some students in the thematic area of this study.

As the response rate in this study was relatively small, few statistical methods could be applied to analyse the survey data. Consequently, there were limited statistical tests that could be carried out to test the statistical significance of the various sustainability items examined. In this case, a Cronbach’s alpha test was used to validate the question scales and a Cronbach’s alpha coefficient of .83 was obtained, indicating good internal consistency of the majority of the cases.

Data gathered from the pilot online survey were analysed using the following scales: Gender; Age; Study Programme; Course Years; Agreement with Sustainability Issues; Ability to Engage with Sustainability; Willingness to Engage with Sustainability Issues and Frequency of Actions Taken to Promote Sustainability.

- **Gender** was coded on a two-point scale (female = 1, male = 0), with predominately female respondents (92%, n = 34) and males (8%, n = 3).
- **Age** was coded on a two-point scale (16–24 = 1, > 25 = 0) the majority of the participants were between the ages of 16–24 (70%, n = 26) and 11 participants were 25 years and over accounting for 30%.
• **Course Year** was coded on a two-point scale using the following categories (Years 1 and 2 = 0, Years 3 and 4 = 1). 37 participants from third year undergraduate studies (100%) responded to the pilot survey with a mean of .89 and the standard deviation of .315.

• **Study Programme** was coded on a two-point scale, based on category of (1 = full time, 0 = flexible mode). There were six participants studying part time (16%) and 31 participants studying full time (84%).

In terms of the key focus of this study on sustainability, a number of key scales for assessing levels of sustainability competencies were created based on combining a number of question items, as discussed below.

**Willingness**

Summary statistics from 7 questions were used to evaluate learners’ dispositions – willingness to engage with sustainability. Willingness or learners’ dispositions was coded as follows: 1 = willing, 0 = not willing. The cumulative mean of .78 and the standard deviation of .307, with a higher mean statistic, indicates a greater dispersion in pattern for those willing to engage with sustainability and those who were not willing to engage with sustainability issues.

**Abilities**

21 questions were used to ascertain learners’ abilities to engage with sustainability actions/issues. Ability was coded as follows: 1 = able, 0 = not able. The survey results produced a cumulative mean of .63 and the standard deviation of .454 and a Cronbach’s alpha coefficient of .83 indicating good internal consistency of scale for the 16 items used.

**Frequency of Action to Promote Sustainability**

The summary statistics for the 7 questions that evaluated the frequency of actions taken by learners as manifestations of competencies in change agency for sustainability were used to ascertain the frequency of action to promote sustainability. The responses were coded as follows: 1 = at least once; 0 = Not at all. The cumulative mean = .54; the standard deviation = .498, indicating that a moderate standard deviation of almost .50, shows a slightly even dispersion in the pattern of learners’ frequency of actions taken or not taken to promote sustainability. The results for the seven question items examined also produced a Cronbach’s Alpha coefficient of .81 indicating good internal consistency of scale used.

**Agreement with Sustainability Issues**

Respondents recorded their level of agreement/disagreement with 13 statements on sustainability issues and these responses were coded as follows: 0 = agreement, 1 = disagreement. The initial premise was that agreement with a statement indicated a negative disposition towards sustainability, and disagreement with the statement indicated a positive disposition towards sustainability. These 13 items were summed, with a cumu-
lative mean of .86 and the standard deviation of .334 with a low standard deviation indicating less dispersion in the response patterns for this competence, and this is in line with the fact that the majority of respondents disagreed with most of the statements stated, thus indicating a high level of sustainability competencies on the 13 issues examined. A Cronbach’s alpha of .70 suggests that the scale for these 13 items has good internal consistency. However, it is important to note here that because of a lack of sufficient statistical evidence to test statistical significance, this result is to be viewed cautiously.

Key Findings on Sustainability Competencies

The results of the pilot survey show that cumulatively a high percentage of learners exhibited competencies in the areas of sustainability that were examined.

An important dimension of ‘Dispositions’ towards sustainability can be examined in learners’ willingness to engage in sustainability behaviours and/or actions. Figure 3 illustrates respondents’ willingness/unwillingness to engage in specific inclusive, participatory and authentic actions for sustainability. As far as the willingness to engage with sustainability is concerned, the survey results show that on average 87% of respondents were willing to engage with sustainability and thus have a high level of disposition to do so, while only 13% on average of the respondents lacked the disposition to engage with sustainability thus manifesting a very low level of disposition for sustainability.

![Figure 3. Dispositions: Willing/not willing to engage with sustainability](image)

The participants were also asked to rate their ‘Abilities’ to perform sustainability-related activities. Figure 4 illustrates respondents’ perceived levels of ability to engage in various sustainability actions. In relation to this, results from the survey show that cumulatively 45% of the learners on average perceived themselves as having low abilities to engage with sustainability, while 55% on average perceived themselves as having good abilities to engage with sustainability.
The Dispositions, Abilities and Behaviours (DAB) Framework for Profiling..

Figure 4. Abilities: Perceived levels of abilities to engage with sustainability issues

In relation to actions for sustainability – ‘Behaviours’, the respondents indicated on a frequency scale their level of engagement in sustainability actions. Figure 5 illustrates the frequency with which respondents engaged in sustainability actions (Figure 5 see on next page). As far as the frequency in which learners take actions to promote sustainability, the survey results show that on average 49% of the respondents have taken actions at least once in a week, month or year to promote sustainability, thus acting as change agents and manifesting some level of sustainability competencies for change agency; while 51% of learners on average have not taken any actions to promote sustainability which could be suggestive of a negative disposition or low level of ability in the competence of change agency.

Thus, when the results of the pilot study are viewed through the lens of the DAB framework we can conclude that overall this sample group were very positively disposed towards sustainability (Dispositions), almost half of them felt they lacked skills/abilities
to perform particular sustainability actions (Abilities), and that there existed very close to a 50-50 split in students engaged/ not engaged in sustainability actions (Behaviours). Further research would be required to investigate the disjoint between the very high degree of willingness to engage in sustainability (87% on average across this cohort of students) and the lower levels of action for sustainability (circa 50% on average).

Figure 5. Behaviours: Frequency of actions taken for sustainability

Finally, the initial intention was that the dimension of Dispositions in sustainability would also be examined or informed by learners’ considerations of a set of statements on key sustainability issues; their responses were ranked on a scale from 1 to 5, indicating their level of agreement or disagreement. For instance, dumping waste in the seas and oceans is acceptable. Figure 6 illustrates the respondents’ level of agreement/disagreement with specific perspectives or stances on sustainability.

The data analysed from this section of the survey indicated that the majority of the learners, with a cumulative average response of 83% disagreeing with the statements, displayed critical awareness of the sustainability issues examined; while the minority of learners, 17% of the respondents on average agreeing with the sustainability statements, displayed a lack of knowledge of or appreciation for sustainability issues. However, it cannot be concluded that there is a direct correlation between the levels of agreement or disagreement to statements on this survey and negative or positive dispositions towards sustainability as this would involve making presumptions about the levels of and relationships between, knowledge and dispositions of learners. As a result of this ambiguity, in analysing responses to these statements, it has been decided that future manifestations of the online survey will not include this section.
The overall findings of this study present a good snapshot of higher education learners’ sustainability competencies and how these students’ sustainability competencies can be profiled at a given point in time. Despite the limitations in the number of learners who responded to the study questionnaire, the findings of this study present us with important lessons to learn with regard to higher education learners’ dispositions, abilities and behaviour (actions) with regard to engaging with sustainability related challenges.

The study findings show that despite the provisions of extensive information and awareness campaigns on environmental matters (for instance, through campus greening initiatives), many higher education learners (46%), as shown in Figure 3, are not willing to develop climate actions plans for their communities. Also, over 63% of the learners
do not have the abilities to develop a strategy to reduce the future environmental footprints of their local communities as shown in Figure 4. The same situation is exhibited in the fact that well over 68% of the learners did not take actions to advocate for their local community sustainability, and over 62% of them did not take any actions to advocate for environmental justice as shown in figure 5.

These findings clearly indicate that despite general awareness on environmental matters there is the need to mainstream climate change education in higher education curricula so as to provide learners with the knowledge, skills and competencies to carry out strategic planning for climate change actions and natural disaster mitigation to make their communities more resilient and sustainable.

Another important aspect of sustainability which the study findings present is the issue of learners’ value orientations in relation to sustainability. The study findings show that with regard to sustainability values like car-sharing when travelling to work or to school, the majority of higher education learners surveyed (78%), as shown in Figure 3, are willing to engage in car-share to school or work. This finding is a good pointer to the fact that present-day higher education learners are beginning to realise the need to reduce the volume of carbon dioxide emitted into the atmosphere through the increased volumes of automobiles on our roads. These students’ values orientations suggest alignment with some key sustainability values; in this case, their willingness to engage in car-sharing when travelling to school or work. However, a small percentage of the students surveyed (22%) still nurture the values of prosperity, viewed in terms of wealth and property accumulation. Thus these learners cherish the comfort of enjoying single occupancy of their cars to travel to school or work if they have the means to do so, instead of engaging in car-share, even if they are aware of the benefits to the atmosphere of reduced carbon emissions through the reduction in the volume of automobiles on our roads.

Furthermore, the majority of the learners (95%) disagreed with the statement ‘All the talk about climate change is politicking, and there is no real need to take action’. Despite vigorous campaigns by contrarians (especially multinational oil corporations which consider corporate profiteering to be of prime importance over environmental concerns), there is enormous scientific evidence that increasing global temperatures are a threat not only to the environment but also to human societies (Pachauri & Meyer, 2014). These learners’ responses suggest recognition of the fact that climate change is a serious issue that needs to be addressed.

As outlined earlier, there are currently no paradigmatic frameworks to guide educators in assessing higher education learners’ sustainability competencies, although there is growing interest and calls for integrating sustainability across higher education curricular (Benn & Dunphy, 2009; Hopkinson & James, 2010; Makrakis & Kostoulas-Makrakis 2013;). In terms of assessing sustainability-related knowledge, skills, dispositions and behaviours, there have been many attempts to develop scales, mainly within the context of environmental education. The most well known of these is the Dunlap and Van Liere’s (1978) New Environmental Paradigm Scale (original NEP), a 12-item scale for ascertaining when populations in transition to more environmentally conscious worldviews, which was subsequently reviewed, revised and renamed by the Dunlap and his colleagues to become a 15-item Revised New Ecological Paradigm Scale (Dunlap, Van Liere, Mertig, & Jones, 2000). Other scales include the Ecocentric and Anthropocentric Attitudes towards Sustainable Development (EAATSD) scale, which is used to evaluate students’ perception of relationship between environmental and
social issues (Kopnina, 2013), and the Sustainability Tracking and Rating System (STARS), a tool developed by the Association for the Advancement of Sustainability in Higher Education (AASHE, 2012) for assessing both learners’ and staff sustainability knowledge and activities. However, the STARS and similar tools are principally designed to assess higher education campus greening activities and are thus not appropriate tools for undertaking a holistic assessment, or in profiling, of learners’ sustainability competencies.

More recently, Zwickle, Koontz, Slagle and Bruskotter (2014) designed a multiple choice survey as a tool for assessing higher education students’ sustainability knowledge and used statistical analysis to present the results of their survey. However, in the absence of articulation of what was understood as sustainability knowledge and what sustainability criteria underpinned the design of the tool, it is difficult to critically engage in an analysis of their findings. Interestingly, the study of Zwickle et al. (2014) also highlights the difficulties of engaging higher education learners in responding to online surveys on SE in general and assessment of learners’ sustainability knowledge and competencies in particular. The authors explain that their university-wide survey to assess students’ sustainability knowledge with a sample of more 40000 undergraduate students enrolled in Ohio State University in the United States of America had a response rate of only 1,389 students (13.3% of their sample). In comparison to their limited response rate, the response rate in the DAB study of 38% looks very healthy, although the overall target group for the DAB pilot study was very small when compared to their study.

Conclusions

Changes in human behaviours to embrace sustainability can be activated through formal, non-formal and informal educational processes. Higher education institutions have an important role to play as drivers of education, training and policy enhancement for sustainability. As advocated in the University Charter for Sustainable Development (Copernicus, 1994), the Talloires Declaration (2005), the UN Decade of Education for Sustainable 2005–2014 (UNESCO, 2007) and the Council of the European Union’s (2011) strategic framework for European cooperation in education and training 2020, universities and other higher education institutions are called upon to play a critical role in mobilising and fostering learners’ acquisition of sustainability competences. Higher education institutions have the expertise to foster the knowledge and skills necessary to enable students devise preventative strategies and/or solutions to sustainability related issues now and in the future. In this regard, the DAB framework emergent from this study comes at an important juncture for higher education. It offers higher education institutions, educators and/or researchers opportunities to better understand the nature and extent of competencies development (with respect to sustainability-related abilities, attitudes and actions) within higher education. The findings of this pilot study show that the online survey tool can be used by educators to profile learners’ sustainability competencies in higher education and provides a useful snapshot of their perceived competencies with respect to sustainability at particular point/s in time.

Finally, as outlined previously, the results of this pilot study need to be cautiously considered because of the small size of the sample. This pilot study mainly intended to inform us on the reliability and internal construct consistency of the DAB-informed sustainability competencies survey tool, ahead of its deployment on a university-wide basis in 2015. Data from the university wide survey in 2015 will be subjected to a
thorough and rigorous statistical analysis, since the survey will be deployed with a much larger sample of students, with the expectation of much higher participation levels of students). In terms of encouraging participation, the large-scale deployment of DAB survey tool (and corresponding informational events about the research study) will be time-tabled to ensure that there are no conflicts with assignment deadlines. Furthermore, more emphasis will be placed on the benefits of engagement in the survey (such as opportunities to informSE) in the informational events with students. This future study will thus examine whether the DAB-informed survey tool can be used as an instrument to profile sustainability competencies across cohorts of students in a range of disciplinary and trans-disciplinary contexts across their life-span of higher education.

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Digital Citizenship in the Afterschool Space: Implications for Education for Sustainable Development

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Abstract
Education for sustainable development (ESD) challenges traditional curricula and formal schooling in important ways. ESD requires systemic thinking, interdisciplinarity and is strengthened through the contributions of all disciplines. As with any transformative societal and technological shift, new questions arise when educators are required to venture into unchartered waters. Research has led to some interesting findings concerning digital literacies in the K-12 classroom. One finding is that a great deal of digital media learning is happening outside the traditional classroom space and is taking place in the afterschool space (Prensky, 2010). Understanding the nature of learning in the afterschool space and bridging the current divide between formal schooling and the learning happening online is critical to the establishment of core ESD values and skills, namely ethical online communities and the development of respectful, tolerant global digital citizens.

Keywords: digital media, education for sustainable development, New Literacies, digital citizenship, teacher education

At the core of education for sustainable development (ESD) is the understanding that the education offered by 19th and 20th century formal, traditional schooling is not adequate for the 21st century. Children and young adults are required to develop skills and competencies that have been largely excluded from the curricula of traditional schooling in the last century. A recent report on the future of education, the Equinox Blueprint: Learning 2030 prepared by the Waterloo Global Science Initiative (2014) states,

Students will need to learn how to learn – how to gather and synthesize information from many sources, how to think critically about it, and how to fashion creative responses to problems and challenges. In addition to reading, writing and numeracy, students will need to acquire new literacies such as data visualization and analysis, search literacy and visual literacy (Brooks & Holmes, 2014, p. 10).
Issues of climate change and water, energy and food challenges require innovative thinking from people who can work collaboratively across disciplines and national boundaries. They will need to learn how to be creative and how to foster and develop their innate creativity. Literacy studies and the language arts will be at the core of the endeavor to cultivate the skills, values and creativity necessary to adapt and adopt New Literacies.

As an educator responsible for the preparation of K-12 literacy and language arts teachers, I am interested in how new technologies are radically changing the types of texts people create and interpret. Digital technologies are posing challenges for literacy educators and disrupting the entire field of literacy education in interesting ways. As with any transformative societal shift, new questions arise, and educators are required to venture into unchartered waters. There are those who believe incorporating digital literacies including visual, audio, multimodal, multimedia literacy overwhelms the language arts. In contrast, there are those who advocate for a radical re-formulation of the discipline to include New Literacies (Burn & Nixon, 2005). The significance of New Literacies reaches beyond technical skills and has more to do with how it enables people to build and participate in literacy practices that involve different kinds of values, sensibilities, norms and procedures from those that characterise conventional literacies (Doering, Beach, & O’Brien, 2007). Specifically, New Literacies incorporate the values and pedagogies of collaboration and participation, the harnessing of collective intelligence, the building of relationships and the de-centering of authorship. ESD provides a context whereby literacy educators can bridge old binaries that divide and position literacy and language arts pedagogy and content on one side and technology on another.

My research is built on the premise that pre-service teachers of literacy and the language arts should be prepared to facilitate more complex, inclusive approaches to teaching children how to compose texts that reflect the New Literacies as new practices. As future teachers of writing, pre-service education students engaged in creating multimodal, multimedia texts during their teacher education will be better prepared to facilitate the design and production of multimodal, multimedia texts. The premise is that the experience of creating digital texts will allow the children that pre-service teachers will one day teach to draw on both social and genre knowledge in the creation of original texts and to move across digital modes. This line of inquiry has led to some interesting findings and new questions concerning not only digital literacies in the K-12 classroom, but also the place for digital literacies in the pre-service teacher education classroom.

Erasing divisions between literacy and technology and understanding the relationship between traditional and digital texts means embracing evolving definitions of texts. Recently, I conducted research designed to immerse pre-service English education students in the creation of multimodal, multimedia texts as part of a digital composing workshop (Howard, 2014). A growing number of researchers are exploring the media practices and emerging digital literacies of children and youth (Barrell & Hammett, 2002; Knobel & Lankshear, 2007; Mills, 2010), yet few studies have inquired into the composing processes of pre-service literacy teachers and the pedagogical possibilities to emerge from immersing prospective literacy teachers in constructing multimodal, multimedia texts (Buck, 2012; Robertson, Hughes, & Smith, 2012). My research set out to determine what happens when English educators provide authentic, engaging opportunities for pre-service literacy teachers to learn about and through multimedia, multimodal digital technologies. As is so often the case, the research project raised other questions and
pointed in unanticipated directions. The experience of two pre-service English education teachers, Kyle and Anna (pseudonyms), in particular, raised interesting and potentially troubling questions about the experience of creating texts in online spaces. Simply saying students require a broad set of 21st century skills, attitudes, beliefs, knowledge that includes communication, critical thinking, problem solving combined with creativity and innovation is one thing; moving the current system, and preparing teachers and students for a rapidly changing world and unprecedented future challenges is another. Such a transformation is complex and requires understanding the shifts that are taking place in schools currently and capitalising on the emergence of new technologies and new literacies to advance the ESD agenda. Change is occurring in traditional, formal schooling. Students in the West and in many countries around the world are living media saturated lives. Teachers do not have to “teach” students to use new technologies. However, engaging students in authentic, relevant tasks co-designed with them to enhance their skills, their understanding of global realities and their collaborative relationships to complete important tasks that contribute to community requires an understanding of the basic precepts of ESD. This is critical if we want to shift the educational paradigm towards sustainability and well-being.

In the next section, the experience of two pre-service teachers is described to demonstrate the complexity in preparing teachers to facilitate classrooms that fully and authentically embrace New Literacies. Creating texts in online spaces requires not only technological content knowledge, but also a nuanced understanding of how new media composition forms, and the reality of diverse, distant audiences for these compositions, creates real opportunity and real challenge. Let’s take a closer look at the pre-service teachers, Kyle and Anna.

The Afterschool Space

Kyle embodied the observation that while productive, authentic, meaningful learning is happening in young people’s lives; it is just not happening that often in formal, traditional classrooms. More often than not this type of learning is occurring in what Prensky (2010) calls the afterschool space. It is a term used to describe the increasing prevalence of informal learning through peers, the Internet, YouTube, cell phones and other emerging technologies and online software applications or apps. It is in the afterschool space that students are in control of their own learning, independently following their own interests and passions. Kyle, a 23 year old pre-service teacher, created a stop motion video as a multimedia text as a part of the research project. Kyle admits that his previous digital projects were never considered “texts”. He said, “I did them on my own time out of my interest in technology. I didn’t consider them texts, but a separate entity.” Kyle revealed that his technical skills in stop motion animation were partially self-taught, yet he developed the skills mainly in DIY online spaces, viewing YouTube videos, talking to friends and watching tutorials online.

What can be made of this apparent division between the classroom and the learning happening informally in young people’s lives? Kyle’s experience creating multimedia texts in an online environment outside the boundaries of traditional schooling, or what Prensky (2010) calls the afterschool space, leads me to ask the questions: What is the meaning of the afterschool space in the lives of young people as it relates to multimedia literacies? What kind of learning is happening there? How do students experience the
space? What are the connections between the afterschool space and the formal classroom? To re-orient education for the values of sustainability, how can the two spaces be integrated? Should they be integrated? Students are spending increasing amounts of time in online spaces outside the traditional classroom. It is estimated that 64% of teens engage in content creation in online participatory spaces (Lankshear & Knobel, 2007)

Students are immersed in what Jenkins (2006) has termed “participatory culture”. Participatory culture shifts the focus from individual expression to community involvement, and these online communities to which students belong provide strong incentives for creative expressions and active participation.

Scholars debate the nature of the online community or cyber community. Some argue the ‘cyber community’ is based on connectivity and belonging-ness, sharing personal thoughts and opinions, sharing passions and deep interests, creating a sense of ownership and rituals of practice (Thomas, 2008). Some media scholars even go as far to say that the experience of being “wired” and connected to others sharing what matters most to you often results in the fusion of technology and personal investment in online relationships which results in those same online relationships being integral to a young person’s identity. So much so that the experience of not being connected or wired leads to young people not feeling like “themselves”. What are the implications for the traditional classroom where students may be equipped with mediocre or, in many cases, no technology? According to Thomas (2008), “at best it leaves them bored or somewhat frustrated, at worst it leaves them incapacitated, disempowered and unenthused, powerfully affecting their social futures” (p. 678). This relates to a major challenge that ESD hopes to address, namely the intellectual disengagement of students in traditional schooling. Hopkins (2013) reports, “A Canadian Education Association survey of secondary students showed that by grade 12, only 37% of the students felt intellectually engaged in school (p. 25). ESD approaches that channel authentic, relevant, real world learning may go along way to addressing this issue.

Other scholars contest the notion of “membership” and “community” as they relate to online spaces. DeVane (2012) uses the notion of affinity spaces to understand how identity formation happens online. According to Gee (2004), affinity spaces are social spaces in which people affiliate and learn on the basis of shared interest and endeavour. DeVane posits that the notion of community does not capture all that happens in affinity spaces. The new focus is “not centered on a social groups’ constitution or boundaries of membership, but rather on the activity undertaken by learners” (DeVane, 2012, p. 166). Online affinity spaces offer their participants the opportunity to participate pseudonymously or even anonymously, which impacts the traditional notions of community and belonging. The population of these groups can range into the thousands, which also makes the idea of membership more complicated in many respects. Still, affinity spaces are sites where social processes like collaboration, competition, apprenticeship, affiliation and exclusion greatly affect how people learn and participate.

Gee (2004) contrasts the learning in an affinity space with that of the traditional classroom. Classrooms tend to reward individual knowledge, not distributed knowledge. They do not often encourage students to network with each other and rarely do so beyond the physical classroom space using various tools and technologies. Classrooms tend to constrain and strictly control where students gain knowledge. They rarely honour skills or knowledge that falls outside a narrow academic domain. Kyle shared his frustration with the interviewer saying his creation of a digital media text as part of the
research project was the first time in his students’ experience that such an activity was valued and did not directly compete for time with more traditional school-based learning activities.

Similarly, Abrams, Gerber and Burgess (2012) describe students’ experiences that indicate disillusionment with formal schooling due to academic struggle and social exclusion. The researchers, through unique case studies of secondary school students, demonstrate complex learning and literacy practices happening predominately through game play occurring in the afterschool space. They highlighted the experience of Robbie, a struggling learner in the classroom immersed in the online experience of playing battlefield 1942, a World War 2 first person shooter game. Robbie’s game play was the impetus for him to access other websites, podcasts, traditional encyclopedias, the History Channel programming to learn tactics to enhance his game play. The researchers add that “in addition to discovering information through reading and interpreting written text, images, sounds, movements, Robbie took risks in a safe, self-chosen, virtual environment” (Abrams et al., 2012, p. 97). He even obtained a Croatian-English dictionary to better understand his Croatian teammates in the Battlefield 1942 game. However, Robbie never thought of his gaming as being related to learning or had any connection to his traditional academic work.

Gee (2004) challenges a teacher to consider the spaces in which young people are spending more of their time and are arguably experiencing a powerful vision of learning, affiliation and identity. In the afterschool spaces, learning becomes a personal and social journey in which the students grow in proficiency most often doing things they enjoy and are passionate about with like-minded others. The challenge for educators is to honestly evaluate traditional models of teaching and assessment that fall far short of the engagement and the daily demands of our digitally charged world.

Text Creation in Affinity Spaces

The second student is Anna – an enthusiastic 23-year-old – came to the teacher education programme from a Bachelor of Arts degree majoring in English and drama. She said, “I have been drawing with Photoshop since I was young, but I haven’t done it for years. I had lost my connection with digital art, and I used this project to re-connect with an old passion.” Anna fully embraces the expanded notion of text to include multimedia digital texts. Her undergraduate English degree included “a class where we studied paintings and poetry together (from the same historical period), in another class we studied film and in a Gothic literature class we studied film and comic books”. As part of the research project, Anna chose to respond to the poem “Valentine” by Carol Ann Duffy through a digitally constructed visual representation. Anna created the digital image using the online affinity site DeviantArt.com The site describes itself as, “a community destination... a platform that allows emerging and established artists to exhibit, promote and share their works within a peer community dedicated to the arts...” (about.DeviantArt.com).

The rise of digital culture is remaking reading and writing as central to many spheres of young people’s lives, including work, school, recreation and communication. New and innovative technology has created changes and challenges in formal education while suggesting new ways of teaching and learning, including how literacy educators teach writing (Swenson, Rozema, Young, McGrail, & Whitin, 2006). Traditionally,
writing and writing methodologies regarded computer technologies as tools useful for word processing capability (Soven, 1999). Popular and influential writing methodology texts published in the last two decades view the relationship between computers and writing for, primarily, their word processing capability whereby student writers “mess around more with text-saving, rearranging, adding, deleting” (Atwell, 1993, p. 102). The widespread introduction of word processing did not challenge our notions of textuality and literacy because the technology was seen as directly related to preparing documents for printing on paper (Dobson & Willinsky, 2009).

An analysis of the sophisticated level of response required to create the digital media text goes beyond the scope of this paper. But it should be said Anna was able to read the poem for personal connections and then combine strategies, resources and technologies to formulate a response. Choosing the form allowed her to explore, clarify and reflect on her thoughts and prior learning while using her imagination. Creating the text while drawing on a global community of like-minded individuals to offer feedback in a highly generative, participatory environment provides a learning experience that embodies the pull approach to learning rather than the traditional “push” approach. Anna’s capabilities and engagement are fostered and develop in such a participatory community as she is helped to learn and also to innovate by pursuing paths of learning tailored specifically to her needs.

The afterschool space is central to the shifting landscape of literacy education due to the increasing availability of new media. Not that long ago, it would have been common to think that most young people would do the bulk of their composing in school, but this is rapidly changing. Writers are influenced by an audience of known or unknown readers. They write and create texts differently in these authentic situations. The shift of writing inside the affinity space has consequences for the writing process, including planning, motivation and metacognition (Magnifico, 2012). In traditional classrooms, the motivation to engage in writing comes primarily from the teacher – students generally write for teachers in order to be assessed for their knowledge and skill. In the afterschool space the motivation comes from elsewhere. Writing in affinity spaces takes place within a community and is most often a tool for expression, creativity and communication. Writers within these spaces also receive audience feedback. Thomas (2008) reports that one of her research participants said, “... that within a week of posting a piece of fanfiction, she received over 100 responses of critical feedback about all aspects of her writing, from plot development to spelling” (p. 692).

Anna’s participation in the DeviantArt.com affinity space represented demonstrates the sophisticated participatory medium, and the dynamic ecological system that the web has become as it provides rich opportunities for sharing and supports “multiple modes of learning” (Brown & Adler, 2008, p. 18). Anna, in essence, brought her online social network into the project and all of those people had access to what Anna was doing in the research project. In describing in an interview what happens on DeviantArt.com Anna said,

_The environment is very supportive. The majority of comments are pleasant unless you post something controversial, and the community looks forward to future posts. When I upload something to the website, I always receive a “welcome back” or “nice to see you” from other members. As well, even the more popular artists will generally answer questions you post on their art. For example, if someone creates an image and I want to know how they_
added text to it, they will either explain their method or send a link to a tutorial. Everyone always helps when asked. As well, DeviantArt now has its own chat room section where artists can talk about just about anything. The rooms are sectioned by topics, such as photography or a region. Individuals can even create their own rooms. Contests are held in many of these chat rooms. Others are for sharing your art, and some are just for moral support. If you are having a bad day and want to be cheered up, a quick stroll to the chat rooms will brighten your day.

Anna is describing a community of practice that is supportive, that provides mentorship, scaffolding, and it would seem, camaraderie. However, it must be noted that this is not always the case, and such support is not everyone’s experience.

In preliminary research, I interviewed 11 fanfiction site users ranging in ages from 18 to 25. Each described their experience of creating fanworks inside affinity spaces as generally a positive one. In responding to the question of what specifically was positive about the experience participants wrote,

- “It (writing in an affinity space) has helped in the growth of my literacy practices in that I was slowly able to improve my spelling, grammar etc., by constantly writing and having my online friends point out my mistakes, giving me constructive criticism, positive reinforcement/feedback etc.”
- “My self-confidence and writing skills have grown. Through Tumblr, I have met friends from all over the world who I regularly talk with and we work together on projects. Polite criticism and advice have really inspired me to move out of my comfort zone and helped me progress as a writer.”
- “I found that roleplaying (RP) on Tumblr has improved my literary skills. By having feedback from fellow RPers, I have found how I RP my characters, what needed to be improved on and what I did well.”

With the rise of new media sites such as games and fanfiction communities, young people are no longer constrained to writing for teachers in traditional school settings. In new media, affinity spaces writers seek social connections with other users who are interested in the same kinds of activities and topics. Typical responses to the question asking what is positive about creating texts in online affinity spaces were:

- “I have met many, many friends through sharing my creations and seeing other’s as well.”
- “It’s fun to connect with people that have the same interest as you!”
- “It helped me meet amazing people, it helped me cope with my depression during the times I was seeing a therapist.”
- “Communicating with others who share my interests on Tumblr and on FanFiction.net forums enabled me to meet a variety of interesting people, several of whom I’m proud to call best friends today.”

However, in Canada and the United States, many traditional schools have responded to the shift towards social writing with fear, locking down social networks and blogs on school computers, forbidding the wide audience that comes with an internet that is
open to a variety of writing topics and sites (Magnifico, 2012). Schools are struggling
to find the balance and negotiate what these new technologies and media spaces mean
for learning and for the development of children and youth. While much has been
written about the potential of new media to radically transform learning, there may
also be a sense by many that the new media boosterism is naively celebratory in the face
of real concerns and dangers. Despite a unanimous overall positive response to their
online text creation experiences, each participant was able to detail instances that were
negative and would raise cause for some concern.

... I have received several hate messages for things I choose to draw (people
that don’t like who I pair characters with) but overall it doesn’t affect me too
much.

I used to get death threats for not liking some characters.

Being stalked by a person who roleplayed and wouldn’t leave me alone, plus
they were several years older than me.

Everyone has an opinion and if you don’t agree you’re harassed or worse.
They will hate on you if you portray a character wrong.

Schools have legitimate concerns about safety, especially in the face of intensely
media covered cases involving cyber harassment and the suicide of targeted victims.
Also, recent reports have raised alarms about the amount of time young people spend
on screen media (Jenkins, 2006). Without diminishing the concerns about lack of real
world play spaces, the detrimental health affects, the moral values and commercial
messages to which young people are exposed, the focus on such negative effects does
not provide the complete picture.

ESD and Teaching New Media Literacies

It has been shown that the *afterschool* space is a dynamic and engaging environment
for many young people where they are hard at work teaching themselves and others
very important things that are relevant to them now and will be useful to them in the
future. Traditional schooling must find ways to better align itself with what is already
happening in students’ informal educational lives. Young people require knowledge
about how to negotiate the promise and the peril of participatory culture. Children and
young people need adult supervision and guidance. They require the critical skills to
articulate their experiences with new and emerging media practices. Schools must be
instrumental in helping young people to develop the ethical norms and critical conscious-
ness to deal with complex and diverse social environments online. The challenge of
ESD pedagogies is to help bridge the gap that currently exists. The opportunities for
rich learning to nurture the values of sustainability are too great to ignore. Jenkins
(2006) states,

_The new literacies almost all involve social skills developed through collabora-
tion and networking. These skills build on the foundation of traditional litera-
ncy, research skills, technical skills and critical analysis skills taught in the class-
room._ (p. 29)
Rather than attempt to control, constrain, shut down and ban opportunities for students’ online engagement and social participation and by doing so exacerbate the sense of irrelevancy and disengagement of young people, schools must take on the challenge of integrating traditional literacy with new media literacies to promote the tenets of ESD.

Ethics, Norms and Rules of the Affinity Space

The potential for authentic learning and developing important skills, and creative, original ideas in affinity spaces is too great to simply ignore. These spaces have the possibility to help to foster thoughtful, engaged global citizens able to build creative networks, create new knowledge and take on complex problems, precisely what groups like the Waterloo Global Science Initiative (2014) and other forward thinking stakeholders in education espouse as an example of 21st century learning. Young people are navigating these spaces with varying degrees of success. What they require are knowledgeable guides who can help them to understand the dynamics of these spaces and critically analyse their own involvement and the involvement of others. Henderson (2013) points to the need to critically examine participatory cultures and to see them as bounded by the rules of the culture. Students can be taught to ask who has the power to set topics of discussion and organise the contributions. And how are initiates inculcated into the culture of the space? What is the over-riding climate in the space? Finding spaces with clearly developed and articulated rules may be indicative of the future success of the online community. However, Henderson (2013) points out that “the rules of participation ... are not universal. Rules that govern online interaction, for example, posting, commenting, uploading, sharing, inviting, are unique to each participatory culture... Learning the rules for one certainly doesn’t mean learning the rules for all” (p. 274). My preliminary research bears out the difficulty that can result when confusion over norms, rules and roles occurs.

One student wrote in response to a question about the level of support experienced within an online community:

*It started off fun and easy going but as time went on things just became more toxic. My co-administrator began pushing ideas into the universe I had created without consulting me first. I ran my own forum for about four years until my co-administrator pushed me too far, and we had to ban him.*

Students can be assisted to develop online social skills by being critically aware of how the spaces into which they venture may be organised and if the space is a good “fit” for them and their particular sensibilities. Students can be allowed to realise in a supportive manner that many affinity sites are governed by informal rules, and they may be vigorously enforced through public reprimand. Learning is happening in these spaces, but it may not be happening through positive or constructive feedback. As indicated in the comment above, control over input is wielded when the perception is that the rules and norms have been breached. The individual affront of “pushing me too far” was met with the communal response “we had to ban him”. To meet an ethical standard of participation, rules must be developed by members, enforced fairly and taught consistently to new members. Without such adherence to ethical norms and rules, community groups eventually fail.
Some respondents indicated knowledge of and a willingness to use, features of the online platforms they were using to control respondents and shape the environment to ensure a level of support with they felt comfortable.

*For fanfiction.net, I can control whether or not people review anonymously by turning the option on or off. I can also delete anonymous reviews. On Tumblr, I can control who sends me asks, whether they can do it anonymously. I can control who sees my posts on Tumblr.*

*I have turned off the Anonymous message feature on Tumblr due to some hateful messages and occasionally turn off comments on DeviantArt.*

More respondents, however, indicated they did not use these features at all. Teaching students to seek out the features designed to safeguard privacy and control hateful or harassing commentary provides another level of skillful use of the software.

Formal schooling and traditional schools must become the champions of ethics in the online participatory spaces being frequented by young people. Teaching young people to expect participants in their online communities to adhere to a high level of conduct that forbids taunting, mocking, threats, hateful belittling and harassment will allow online communities to reach their full potential and support the establishment of online spaces guided by a sense of equality, respect and tolerance. It is schools’ moral obligation and pedagogical responsibility to the education and well-being of our children and youth to become engaged in the afterschool space and use it as a powerful tool to shape the next generation of digital and global citizens. ESD is perfectly positioned to provide the pedagogical framework through which such learning can take place. Kozak and Elliott (2014) provide learning strategies for developing a focus on sustainability and provide a context in which the content, skills, and ethics required for digital global citizenship could be realized. Those strategies

- link economic, social and environmental issues within subjects, between subjects and across all subjects;
- link students to each other, their home life, their school and their community (Kozak & Elliott, 2014).

It is only by understanding young people’s involvement in the afterschool space and making connections to the realities of the digital lives of students can we bring relevance to learning and provide the necessary skills the young require to thrive as global citizens. Education for sustainability is the catalyst that can provide a way forward for this challenging imperative.

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**References**


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Abstract

This study investigated stress levels of pre-service teachers (PSTs) across three categories of teaching context: early childhood, primary and secondary. This paper focused on exploring the stressors in the completion of tasks in teaching practicum in the three categories of teaching context and an awareness of and access to support systems. The Perceived Stress Scale (PSS) and an online questionnaire were used to measure the nature and level of stress. Significant results were found in relation to the school climate and the stress levels of PSTs across the three different teaching contexts. These findings have implications in terms of understanding different PSTs’ stress levels across the three teaching contexts and ways they could be supported to reduce their stress level and achieve better study outcomes.

Keywords: pre-service teachers, stress levels, teaching practicum, school climate, teaching context
Different teaching contexts have different school climate. School climate has been identified as an important factor which can assist in nurturing teachers’ social and emotional awareness to recognise and manage their emotions (Payton, Weissbeig, Durlak, Dymnicki, Taylor, Schellinger, & Pachan, 2008), managing their stress levels (Ransford, Greenberg, Domitrovich, Small, & Jacobson, 2009), improving academic achievement and self-efficacy beliefs (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger 2011; Zins & Ellias, 2007; Zins, Bloodworth, Weissberg, & Walberg, 2007), developing positive relationship between teachers, students as well as between teachers within a school environment (Jennings & Greenberg, 2009) and increasing job satisfaction (Brackett, Palomera, Mojsa-Kaja, Reyes, & Salovey, 2010).

Based upon the review of school climate, studying the category of teaching context, i.e. early childhood, primary or secondary, is reported to influence teachers’ commitment. The age of students were also related with teachers’ teaching motivation and stress levels (Klassen & Chiu, 2011). For example, Klassen and Chiu (2010) found that teachers who were teaching young children in primary and early childhood settings had high self-efficacy and low stress levels for classroom and students’ engagement. Geving (2007) and Wolters and Daugherty (2007) reported that, although they found no significant difference of stress levels between primary and secondary teachers, the behaviours of secondary school students could increase teachers’ stress levels in comparison to primary school students’ behaviours.

Research has shown that teachers’ self-efficacy beliefs can influence job satisfaction and mediate job stress (Klassen & Chiu, 2010). In educational research, self-efficacy has played an important role in influencing achievement and behaviour. A theoretical framework of self-efficacy developed by Bandura (1997) has been used to boost successful human achievement in educational settings. More recently, research by Klassen and Chiu (2011) and Skaalvik and Skaalvik (2007) found that teachers’ self-efficacy mainly influences their management of students’ behaviour and reconciling its relationship with their stress (Shen, 2008). Ware and Kitsantas (2007) also stated that self-efficacy beliefs contributed as a protective shield against teachers’ attrition.

Pre-service Teachers’ (PSTs’) Stress Levels

PSTs (PSTs) are required to undertake teaching practicums, in addition to a theoretical study load (Australian Institute for Teaching and School Leadership [AITSL], 2015; Mitchell, Maher, & Brown, 2008). During their professional practicums, PSTs are required to complete a range of experiential tasks, such as building familiarity with school culture, working very closely with their mentor teachers and planning their teaching and are assessed on their performance in the practicums (Chung, 2008). In addition to the performance tasks in placement schools, PSTs are expected to collaborate with peers on academic theory tasks and are assessed on this collective work in the university setting (Chung, 2008). Findings of Caires, Almeida and Martins (2010) indicated that the level of practicum success was tied to future employment opportunities. In the studies by Chaplain (2008), the teaching practicum was rated as the most stressful task for PSTs, and this needs to be seen in the context of PSTs’ decisions to stay in the teaching profession being strongly influenced by their stress levels. This indicates that study demands can create varying levels of stress among students and, unmanaged, has potential to lead to undesirable health and career outcomes (Klassen & Chiu, 2011).
Although teaching practicums were rated as the most stressful of study tasks, every PST’s reaction to stress depends on personal and environmental resources (Klassen & Durksen, 2014). Chaplain (2008) stated there were three stressors in teaching practicum: behaviour management, workload and a lack of support from mentor teachers and administrators. Klassen and Chiu (2010) also identified other stressors such as gender of teachers studying early childhood, primary or secondary teacher education programs. For example, one of their important findings was that female teachers, who were more stressed than male teachers, demonstrated lower classroom management and self-efficacy.

In contrast to experienced teachers, PSTs have higher competency and confidence demands (Klassen & Chiu, 2011). Although studies (Klassen, Tze, Betts, & Gordon, 2011; Knoblauch & Woolfolk Hoy, 2008) suggested that PSTs’ self-efficacy increased during their practicum, PSTs still needed to face the challenge of adapting to the realities of teaching stress in the teaching practicum (Klassen & Durksen, 2014).

It was suggested that relevant workplace resources or ‘job resources’ (Hakanen, Bakker, & Schaufeli, 2006) can be used to improve managing job demands and stress. Richter, Kunter, Lüdtke, Klusmann, Anders and Baumert (2013) further stated that for PSTs, the job resources include access to information, school culture and their mentor teachers’ support. Mentor teachers are considered as the most important job resource, because they can provide PSTs with practical teaching advice. This can result in PST’s enhanced self-efficacy (Richter et al., 2013).

Although there have numerous research conducted on the importance of studying school climate, limited studies were undertaken in relation to the school climate especially from the early childhood teaching context and its impact on stress levels of the in-service teachers and PSTs during their teaching practicum. This study is to focus on PSTs and how the school climate influences the stress levels of PSTs, and what strategies can be used to help PSTs to manage their stress levels.

In summary, despite considerable research on the importance of role of school climate in stress levels of experience teachers and PSTs during their teaching practicum, little is known about the support frameworks that they require. Such frameworks can assist in the retention of PSTs and help teacher educators to foster improved PST well-being, effectiveness of teaching and self-efficacy skills in the classroom. In addition, while there was acknowledgement of the PSTs’ stress in completing their teaching practicum, there was no objective measurement of their stress levels. Therefore, this research aims to use a psychological measurement tool to investigate the relationship between the PSTs’ stress levels and teaching contexts.

Methods

This study employed both quantitative and qualitative research methodologies. Quantitative data was collected using the Perceived Stress Scale (PSS)-10 to estimate the extent to which recent events in a respondent’s life are appraised as stressful. The PSS-10 was developed by Cohen, Kamarch and Mermelstein (1983). PSS-10 is an abbreviated version of the original 14 item PSS that measures the degree to which the participants believe events in their life are currently unpredictable, uncontrollable and overwhelming. It is a self-report, response-balanced instrument that measures the level of perceived stress during the last month, using a 5-point response differential for each of the 14 statements (0 = never, 1 = almost never, 2 = once in a while, 3 = often, 4 = very often).
The higher the score, the more stressful the participants perceive their current life situation. Qualitative data were collected through open ended questions in the questionnaire. The PSS-10 is a brief scale, consisting of only 10 items. It can be administered in a few minutes and is easily scored (Remor, 2006). Summarised by Cohen et al. (1983), the PSS does not raise the possibility of psychiatric problems, rather it is a well-regarded and widely used tool to measure work related stress by many researchers such as Cohen and Janicki-Deverts (2012) and Cohen, Janicki-Deverts and Miller (2007). PSS is not a diagnostic instrument, and there are no norm tables. However, González-Ramírez, Rodríguez-Ayán and Hernández (2013) developed a factor structure based upon a large-scale sample in Mexico. Their data indicated that the normative score range on the PSS-10 for a general population was between 14.52 and 17.73.

On the basis of the results from PSS-10, a purpose designed questionnaire was used in the present study to acquire information from the participant(s) about their demographic characteristics, opinions or prior experience (Gay & Airasian, 2003; Leedy & Ormrod, 2005). The closed questions allowed comparison across respondents. Open ended questions were included in the survey as this “allows for the informants to answer from their own frame of reference rather than being confined by the structure of pre-arranged questions” (Bogdan & Biklen, 1982, p. 135).

Participants

PSTs studying at an Australian university were invited to participate in the study; 291 PSTs from the School of Education at the University provided data, including 31 early childhood (10.7%); 189 primary (64.9%) and 72 secondary (24.7%) PSTs (Figure 1). Early childhood PSTs refer to those who are undertaking teaching practicum in early years of schooling; primary PSTs refer to those who are undertaking teaching practicum in primary schools (transition to Year 6); secondary PSTs refer to those whose teaching practicum are from Year 7 to Year 12.

![Figure 1. Outline of the Project](image_url)

Procedure

The data gathering processes were piloted before the commencement of the main study. This was undertaken to ensure the participants understood the instructions for completing the PSS-10 and the questionnaire items. The PSS-10 and questionnaire were then administered online, with data gathering conducted from May to July, 2014. The questionnaire consisted of 16 closed questions, covering participants’ demographic
investigating the stress levels of early childhood, primary and secondary characteristics and the hours they spent on activities or work associated with their teaching practicum and theory units. The questionnaire also contained eight open-ended questions related to participants’ opinions on how to improve assessment of the placement and theory units.

The researchers used the Statistical Package for Social Science (SPSS) (Version 12) to analyse the responses. One-Way ANOVA was used to investigate the differences of stress level of PSTs between different teaching levels, identified as early childhood, primary and secondary. Qualitative data, such as the participants’ comments on their understanding of the support system, their other work and family commitments and suggestions for improving assessment support were collected, ordered and analysed thematically using NVivo. Qualitative data, such as the participants’ comments on their understanding of the support system, their other work and family commitment and suggestions for improving assessment support, were collected, ordered and analysed thematically using NVivo. Critical discourse analysis (CDA) (Tamatea, 2008) was employed to analyse responses from open-ended questions in the purpose designed questionnaire. CDA is based upon both linguistic theory (Ainsworth & Hardy, 2004; Fairclough, 2001; Henderson, 2005; Wodak, 2001) and social theory (Habermas, 1990). CDA can be used to analyse data through a three-dimensional framework – micro, meso and macro-level interpretations about the participants’ opinions towards framework and strategies or support system that could be used to assist PSTs’ successful learning experience.

Results

Teaching levels and stress

Out of the total 291 participants, 285 completed the PSS-10 scale. It was found that all PSTs from different teaching year levels had higher stress levels than the norm range (14.52–17.73) of a general population sample. The stress level of secondary PSTs was highest among the three teaching levels, followed by the stress level of primary PSTs and the stress level of early childhood PSTs, which was significantly lower than secondary and primary F (2, 286) = 3.26; p = 0.04 (Table 1).

| Stress Levels of PSTs among the Three Categories of Teacher Education Programmes |
|---|---|---|
| Secondary PSTs | n | Mean stress score | SD |
| | 69 | 23.20 | 6.29 |
| Primary PSTs | 187 | 21.18 | 5.97 |
| Early childhood PSTs | 29 | 20.55 | 6.39 |

Demographical characteristics

Although the average age of PSTs was between 18 and 30 years, the teaching courses being taken by the participating PSTs were found to be significantly related to their age. The secondary PSTs were oldest, followed by primary PSTs and early childhood PSTs, who were the youngest, F (2, 286) = 8.07; p < 0.01 (Table 2).
Table 2
Category of PSTs’ Teacher Education Programs and Their Age Groups

<table>
<thead>
<tr>
<th>Category of PSTs</th>
<th>n</th>
<th>Average age score</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary PSTs</td>
<td>71</td>
<td>1.34</td>
<td>0.48</td>
</tr>
<tr>
<td>Primary PSTs</td>
<td>187</td>
<td>1.15</td>
<td>0.36</td>
</tr>
<tr>
<td>Early childhood PSTs</td>
<td>31</td>
<td>1.06</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Note: 1 = 18–25 years old; 2 = 26–30 years old; 3 = 31–40 years old; 4 = 41–50 years old and 5 = >50 years old

Table 3 shows that the percentage of male PSTs in secondary teaching courses was significantly higher than male PSTs in early childhood teaching level, $X^2(2) = 15.43$, $p < 0.01$. More male PSTs elected secondary teaching level, while more female PSTs elected early childhood teaching levels.

Table 3
Category of PSTs’ Teacher Education Programmes and Gender

<table>
<thead>
<tr>
<th>Early childhood</th>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>Female</td>
<td>29</td>
<td>159</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>n</th>
<th>percentage</th>
<th>n</th>
<th>percentage</th>
<th>n</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5%</td>
<td>15.0%</td>
<td>33.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>93.5%</td>
<td>85.0%</td>
<td>66.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tasks in teacher education programmes

The participating PSTs were asked to indicate the hours they spent on both placement tasks and tasks in their theory units, using a rating scale of 1 to 5: 1 = 1–5 hours; 2 = 6–10 hours; 3 = 11–15 hours; 4 = 16–20 hours; 5 = >21 hours. The placement tasks comprised: a) planning for teaching; b) understanding learning materials and completing assignments and c) working with mentors. The tasks in their theory units comprised: a) collaborative group work; b) understanding learning materials and completing assignments and c) working with lecturers. Table 4 and Table 5 show that the percentage and mean of hours spent on placement and theory units tasks by early childhood, primary and secondary PSTs.

A One-Way ANOVA was used to compare the three categories of PSTs’ teacher education programmes with the hours they spent on placement and theory units’ tasks. Table 4 shows that there was no significant difference among the three categories in the hours they spent on tasks in theory units, including understanding learning materials and completing assignments, collaborative group work and working with lecturers. All the three groups of PSTs spent similar hours on understanding learning materials and completing assignments in placement tasks.

However, in placement tasks, it was found that early childhood PSTs spent significantly fewer hours working with mentors and planning for teaching than primary and secondary PSTs. Moreover, secondary PSTs were found to be spending more hours working with mentors than early childhood and primary PSTs; and primary PSTs spent more hours on planning for teaching than early childhood and secondary PSTs. The planning for teaching includes classroom management, delivery of learning content and working with mentor teachers. The secondary PSTs commented specifically on the tasks for planning for teaching. For example, secondary PST 12 observed classroom practice and noted the students’ behaviour management in the planning for teaching.
Table 4
**Hours Spent On Placement and Theory Units Tasks (Percentage)**

<table>
<thead>
<tr>
<th>Tasks</th>
<th>1–5 hours</th>
<th>6–10 hours</th>
<th>11–15 hours</th>
<th>16–20 hours</th>
<th>&gt;21 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EC</td>
<td>Pri</td>
<td>Sec</td>
<td>EC</td>
<td>Pri</td>
</tr>
<tr>
<td><strong>Placement tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding learning materials and</td>
<td>25.9</td>
<td>26.6</td>
<td>38.6</td>
<td>37.0</td>
<td>32.6</td>
</tr>
<tr>
<td>completing assignments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working with mentors</td>
<td>63.0</td>
<td>38.2</td>
<td>34.3</td>
<td>22.2</td>
<td>28.1</td>
</tr>
<tr>
<td>Planning for teaching</td>
<td>53.8</td>
<td>23.6</td>
<td>30.0</td>
<td>30.8</td>
<td>34.6</td>
</tr>
<tr>
<td><strong>Tasks in theory units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding learning materials and</td>
<td>14.3</td>
<td>11.7</td>
<td>14.7</td>
<td>46.4</td>
<td>33.0</td>
</tr>
<tr>
<td>completing assignments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative group work</td>
<td>83.3</td>
<td>73.7</td>
<td>72.6</td>
<td>12.5</td>
<td>19.2</td>
</tr>
<tr>
<td><strong>Working with lecturers</strong></td>
<td>77.3</td>
<td>89.2</td>
<td>88.9</td>
<td>18.2</td>
<td>9.5</td>
</tr>
</tbody>
</table>

Note: a) EC = Early childhood; Pri = Primary; Sec = Secondary; b) 1 = 1–5 hours; 2 = 6–10 hours; 3 = 11–15 hours; 4 = 16–20 hours; 5 = >21 hours
Table 5

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC Pri Sec EC Pri Sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding learning materials and</td>
<td>2.30</td>
<td>2.38</td>
<td>2.21</td>
<td>1.18</td>
</tr>
<tr>
<td>completing assignments</td>
<td>1.10</td>
<td>1.18</td>
<td>1.14</td>
<td>0.50</td>
</tr>
<tr>
<td>Working with mentors</td>
<td>1.63</td>
<td>2.37</td>
<td>2.48</td>
<td>1.04</td>
</tr>
<tr>
<td></td>
<td>1.47</td>
<td>1.52</td>
<td>3.48</td>
<td>0.03</td>
</tr>
<tr>
<td>Planning for teaching</td>
<td>1.69</td>
<td>2.43</td>
<td>2.27</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>0.97</td>
<td>1.17</td>
<td>1.17</td>
<td>4.77</td>
</tr>
<tr>
<td>Collaborative group work</td>
<td>1.25</td>
<td>1.38</td>
<td>1.35</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>0.68</td>
<td>0.77</td>
<td>0.68</td>
<td>0.35</td>
</tr>
<tr>
<td>Working with lecturers</td>
<td>1.27</td>
<td>1.13</td>
<td>1.16</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>0.55</td>
<td>0.45</td>
<td>0.57</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Note: a) EC = Early childhood; Pri = Primary; Sec = Secondary; b) 1 = 1–5 hours; 2 = 6–10 hours; 3 = 11–15 hours; 4 = 16–20 hours; 5 = >21 hours

Not quite so many expectations in what... a pre service teacher has been involved in placement. There is a lot of work expected to be completed – 2 pieces of evidence for AITSL standards 3 & 5–11 in total so 22 pieces of evidence on top of all the planning and lessons as well as handling students behaviour in classrooms. It is an overwhelming workload and has caused me a tremendous amount of stress and anxiety at this time.

The relationship between PST’s stress levels and the hours they spent on different tasks were investigated from three different teaching levels. It was found for secondary PSTs, their stress levels significantly correlated with the time they spent on planning for teaching; r = 0.34; p < 0.01. The more hours the secondary PSTs spent on planning for teaching, the less stress they experienced. There was no significant relationship between the early childhood and primary PSTs and the hours they spent on the tasks.

Awareness of and Access to Support System available

PSTs in all three teaching contexts were asked whether they were aware of or had access to support provided by university and/or placement schools. There was no significant difference between PSTs in the three teaching contexts as to their awareness and access to support from the university, the School of Education and the placement schools. Approximately one-third of all three levels of PSTs was aware of, or had access to, support from the University and its School of Education (Table 6).
Table 6
Awareness and Access to Support from PSTs among Early Childhood, Primary and Secondary Teaching Levels

<table>
<thead>
<tr>
<th></th>
<th>Awareness and access to</th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n, percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early childhood PSTs</td>
<td>Support from School of Education and university</td>
<td>11, 35.5%</td>
<td>4, 12.9%</td>
<td>12, 38.7%</td>
</tr>
<tr>
<td>(n = 31)</td>
<td>Support from placement school</td>
<td>8, 25.8%</td>
<td>10, 32.3%</td>
<td>9, 29.0%</td>
</tr>
<tr>
<td>Primary PSTs (n = 188)</td>
<td>Support from School of Education and university</td>
<td>72, 38.3%</td>
<td>22, 11.7%</td>
<td>91, 48.4%</td>
</tr>
<tr>
<td></td>
<td>Support from placement school</td>
<td>87, 46.3%</td>
<td>54, 28.7%</td>
<td>41, 21.8%</td>
</tr>
<tr>
<td>Secondary PSTs (n = 72)</td>
<td>Support from School of Education and university</td>
<td>27, 37.5%</td>
<td>10, 13.9%</td>
<td>32, 44.4%</td>
</tr>
<tr>
<td></td>
<td>Support from placement school</td>
<td>28, 38.9%</td>
<td>29, 40.3%</td>
<td>13, 18.1%</td>
</tr>
</tbody>
</table>

A total of sixteen secondary PSTs, seventy primary PSTs and four early childhood PSTs provided similar suggestions about reducing their stress levels from various other forms of support. All the PSTs presented comments about the importance of receiving support from mentor teachers (for example, developing lessons, encouragement) to help reduce their stress levels. The figures in bracket represent the number and percentage of participants who indicated the importance of support from mentor teachers.

- Secondary PSTs (15, 93.8%)
- Primary PSTs (58, 82.9%)
- Early Childhood PSTs (1, 25.0%)

For example, secondary PST 58 commented on support from mentor teachers that reduced his stress levels during his teaching practicum.

> My mentor was very open to me about her experience in teaching and gave me some good advice throughout placement.

Comment from secondary PST 10 referred to some of the ways of managing stress by working with her mentor teachers and observing other classes to assist in planning her teaching:

> Assistance provided by mentor teacher in developing lessons. Other placement school teachers – giving tips and encouragement and access to lessons for observation.

Similarly, primary PST 14 commented about the importance of support from mentor teachers in her studies.

> My mentor has always been very helpful and supportive in terms of providing guidance during prac.

Compared to secondary and primary PSTs, early childhood PSTs were aware of the support from mentor teachers, however, they were concerned about the quality of this support. For example, early childhood PST 19 commented:

> The staff (especially childcare) staff do not have any information about what to do with the placement students. They do not know the rights and expectations of the students. I think the staff should be provided proper guide lines and instructions about all these.
Discussion and Conclusion

This study investigated stress levels experienced by PSTs across three teaching contexts: early childhood, primary and secondary. The stressors in their completion of tasks in teacher education programmes, the awareness of and access to support system were explored in detail in this paper. The particular contribution of this study was its identification of the differences in stress levels among the PSTs from the three teaching contexts. The study was therefore to furnish a basis in evidence for developing better support systems to help the three groups of PSTs to reduce their stress level and achieve better study outcomes.

The PSTs from all three teaching contexts were found to be above the normal range of stress levels from González-Ramírez et al. (2013). This finding is consistent with Chaplain (2008) that teaching practicum is a stressful task for PSTs.

It was found that secondary PSTs had the highest stress levels, followed by primary PSTs. The early childhood PSTs had the lowest stress levels. This finding conflicts with Geving (2007) and Wolters and Daugherty (2007) who did not find any significant difference of stress levels between primary and secondary in-service and experienced teachers. One reason for this could be that PSTs have higher levels of competency and confidence than the experienced teachers (Klassen & Chiu, 2011). Secondary PSTs reported the planning for teaching, including management students’ behaviours, as an important stressor for them. This finding agrees with the existing literature (Geving, 2007; Klassen & Chiu, 2010; Wolters & Daugherty, 2007) that stress levels from secondary PSTs were mainly from management of students’ behaviour.

The findings of this study also showed that, although PSTs’ self-efficacy increased during their practicum, PSTs and even experienced teachers in secondary school were reported to have lower self-efficacy than primary teachers (Klassen & Chiu, 2011).

Although all PSTs from the three teaching contexts mentioned the importance of receiving support from mentor teachers, it was found that expectations of the PSTs in different teaching contexts varied. For example, secondary PSTs were expecting their mentor teachers to provide more support on how to plan their teaching. This finding is consistent with another finding in this paper: the secondary PSTs’ stress levels were significantly correlated with the time they spent on planning for teaching and the more hours they spent the less stress they had. This finding agrees with suggestions from Richter et al. (2013) that the support from PSTs’ mentor teachers were a job resource (Hakanen et al., 2006) to improve managing job demands and stress and enhance their self-efficacy. In contrast, early childhood PSTs were expecting more structured and high quality guidelines from their mentor teachers.

This paper found that the age of secondary PSTs’ was higher than primary and early childhood PSTs, and there were more male PSTs in secondary teacher education programmes than that of primary and early childhood. Although Klassen and Chiu (2010) found in their studies that female teachers had higher stress and lower self-efficacy in terms of students’ management than male teachers, the present study found it did not apply to the group of secondary PSTs.

Moreover, there is little existing research that has studied the roles of secondary PSTs’ age and their gender in developing this highly stressed group of PSTs’ self-efficacy beliefs. This also means that further research is needed to investigate these stressors for secondary PSTs and how support systems can be improved.
There are limitations to the study. The data were drawn exclusively from one Australian university. Moreover, while the causes of PSTs’ stress levels were identified, these were not examined in detail. For example, the actual tasks that the PSTs worked on with their mentor teachers were not identified. In addition, exploration of the quality of support from early childhood PSTs’ mentor teachers could be investigated in greater depth. Consequently little comment can be made as to how support should be improved to reduce the stress of PSTs enrolled in the three categories of teacher courses, although there seems to be a particular need in the case of the highly stressed PSTs in secondary teacher courses. Further research is recommended to investigate how support systems can be improved within both practicum schools and universities providing teacher training courses, with a view to reducing all the three groups of students’ stress levels.

References


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Perceptions of the Maltese Public towards Local Marine Protected Areas

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University of Malta, Malta presented

Abstract
The marine environment represents a central component of Malta’s local environment, and its ecosystem services play a vital role in supporting the economy as well as human well-being. Plans have been made to protect the unique ecology found within Maltese waters through the institution of five marine protected areas (MPAs). This quantitative study assessed the environmental knowledge and attitudes of the Maltese public towards the local marine environment, MPAs and education for sustainable development (ESD). A questionnaire was administered to members of the public (n = 200) at three different locations. The study found that although the Maltese public strongly appreciates the beauty of Malta’s marine environment, the level of knowledge surrounding the marine environment is low. Furthermore, the research indicates that while the public agrees that the marine environment should be protected, there is a notable lack of awareness of the five local MPAs. Based on the research findings, a model linking ESD to MPAs and aiming to foster a sense of ownership among the public by encouraging their involvement in the management of local MPAs is proposed.

Keywords: marine protected areas, education for sustainable development, quantitative framework, public perceptions, marine protected areas management

The oceans cover about 70% of our planet (Bollmann et al., 2010) and marine ecosystem services play a vital role in sustaining human well-being (United Nations Environment Programme [UNEP], 2006). However, it is clear that anthropogenic activity has severely altered marine biodiversity (Guidetti et al., 2014), impeding its ability to provide these marine ecosystem services (Worm et al., 2006). In addressing the loss of marine biodiversity, spatial tools such as marine protected areas (MPAs) have been used increasingly throughout the world, and MPAs are now generally regarded as an essential tool for marine conservation (Cullis-Suzuki & Pauly, 2010).

Acknowledging the interconnectedness that exists between the world’s population and oceans (Behnam, 2013), there is evidence that social factors determine an MPA’s success (Leisher et al., 2012). The International Union for the Conservation of Nature (IUCN) guidelines for MPAs emphasise the need to gain the public’s support through education and to generate a sense of ownership, which, along with community, involvement should serve as the main management tools (Kelleher, 1999). The guidelines also
suggest that educational efforts are important as they can result in the reduction of MPA enforcement costs (Kelleher, 1999). Regarding the Cairns section of the Great Barrier Marine Park, Alder (1996) found that education programmes were less expensive than enforcement and also resulted in a wider community impact. Furthermore, a study by Thomassin, White, Stead and Gilbert (2010) on Reunion Island stated that, if local communities are accepting of an MPA, then the MPA managers can focus more on conservation activities instead of those related to enforcement.

The Mediterranean Sea is an important site for conservation as it is a hotspot for marine biodiversity (Coll et al., 2010; Mangos & Claudot, 2013) and is characterised by high rates of endemism as well as habitat diversity (Abdulla, Gomei, Hyrenbach, Notarbartolo-di-Sciara, & Agardy, 2009; Coll et al., 2010; Portman, Notarbartolo-di-Sciara, Agardy, Katsanevakis, Possingham, & Di-Carlo, 2013). In confronting the local situation, the Maltese islands have a landmass of 316km$^2$ (Government of Malta, 2002) in total and a population of about 421,364 (National Statistics Office, 2013). Mangos, Bassino and Sauzade (2010) found that Malta benefits from the Mediterranean’s marine ecosystems at a value of 83 million Euros per year. Currently, in Malta, there are five designated MPAs: Grigal ta’ Malta, Fillfa, Rdum Majjiesa, Mgarr ix-Xini and Dwejra, collectively extending over an estimated 180km$^2$ or 5% of Malta’s territorial waters (Figure 1).

**Figure 1.** Map depicting the location of Malta’s five MPAs

Although management plans have already been drafted or are currently being drafted for all five Maltese MPAs, none have been implemented yet. The designated MPAs have been designed to represent 80% of Malta’s *Posidonia oceanica* meadows (Malta Environment and Planning Authority [MEPA], 2010). This seagrass species is endemic to the Mediterranean and is particularly important in supporting marine biodiversity since it acts as an ecosystem engineer (Michel, Schnitzler, Dupont, Gobert, Nyssen, Dauby, & Lepoint, 2011; Personnic, Boudouresque, Astruch, Ballesteros, Blouet, Bellan-Santini, & Ruitton, 2014).
Methods

The mixed-methods approach was selected as the research methodology, combining the collection of both quantitative and qualitative data. A questionnaire targeting the Maltese public was developed to collect quantitative data, while semi-structured interviews were carried out with key stakeholders for the qualitative data collection. For the purposes of this paper, only the quantitative portion of the research will be considered.

With the Maltese public as the target population, a sample size of 200 was determined based on Malta’s population of 421,364 (National Statistics Office, 2013). This sample size \( n = 200 \) allowed for a confidence interval of 6.93 assuming a confidence level of 95\% (Surveysystems.com, 2014). Out of the 200 respondents, 67\% (134) were female, while 33\% (66) were male. With regard to age, 46\% of the respondents within the sample were between the ages of 20–40 (Figure 2).

Three cities were selected for the administration of the questionnaire: Valletta (Malta), Sliema (Malta) and Victoria (Gozo) (Figure 3). Valletta and Victoria represent the capital cities of Malta and Gozo respectively, while Sliema represents an important leisure location compared to the business nature of Valletta. Convenience sampling was employed as the sampling strategy, and respondents were approached in a variety of locations within the three selected cities.

The final questionnaire was administered to the Maltese public during June and July 2014 following an initial pilot study in June 2014. The pilot questionnaire was administered to 20 members of the public in Valletta to represent 10\% of the sample size \( n = 200 \). Based on the outcome of the pilot study, changes were made to simplify and shorten the final questionnaire. The first part of the questionnaire gathered socio-demographic information while the second part contained statements surrounding the following themes: Knowledge of Malta’s marine environment and MPAs; Attitudes towards Malta’s marine environment and MPAs, the Delivery of marine education for sustainable development (ESD) in Malta. The questionnaire employed a five point Likert scale, and some state-
ments in the questionnaire were adapted from two previous studies addressing a similar research topic (Leisher et al., 2012; Trenouth, Harte, Paterson de Heer, Dewan, Grage, Primo, & Campbell, 2012).

Results

Knowledge of Malta’s Marine Environment and MPAs

Respondents were first asked to name an MPA in Malta, and 87.5% of the sample was unable to do so. Out of the 25 correct answers (n = 200), 17 (68%) named Filfla, 6 (24%) named Dwejra, 1 (4%) named Mgarr ix-Xini, 1 (4%) named Rdum Majjiesa and 0 named Grigal ta’ Malta. In addition, low levels of knowledge surrounding the marine environment among the Maltese public were found. As seen in Table 1, 56.5% of the respondents either disagreed or strongly disagreed that they know a lot about Malta’s marine environment. Furthermore, with regard to MPAs, 49.5% of the sample either disagreed or strongly disagreed that they were familiar with the concept. In addition, 26.5% of the sample were neutral towards whether the goal of MPAs in Malta are to eliminate human activity from the area, pointing to further uncertainty regarding what an MPA is. However, 87% of the respondents did agree or strongly agree that MPAs play an important role in conserving Malta’s marine biodiversity and resources for future generations, suggesting that the Maltese public is aware of the utility of MPAs.

Table 1
Questionnaire Results in Percentage (%) for Knowledge Statements (n = 200)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know a lot about Malta’s marine environment.</td>
<td>1</td>
<td>16.5</td>
<td>26</td>
<td>42.5</td>
<td>14</td>
</tr>
<tr>
<td>I know what marine biodiversity is.</td>
<td>9.5</td>
<td>36</td>
<td>15.5</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>Seagrass in Malta is not important for marine ecosystems.</td>
<td>3</td>
<td>8</td>
<td>19</td>
<td>38</td>
<td>32</td>
</tr>
<tr>
<td>I am familiar with the concept of MPAs.</td>
<td>4.5</td>
<td>27.5</td>
<td>18.5</td>
<td>33</td>
<td>16.5</td>
</tr>
<tr>
<td>The goal of MPAs in Malta is to eliminate human activity from the area.</td>
<td>4.5</td>
<td>24</td>
<td>26.5</td>
<td>29.5</td>
<td>15.5</td>
</tr>
<tr>
<td>MPAs play an important role in conserving Malta’s marine biodiversity and resources for future generations.</td>
<td>30</td>
<td>57</td>
<td>8.5</td>
<td>2</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Attitudes towards Malta’s Marine Environment and MPAs

The Maltese public appears to have positive attitudes towards Malta’s marine environment and MPAs. In fact, as illustrated in Table 2, 93.5% of the respondents either agreed or strongly agreed that they appreciate the beauty of Malta’s marine environment. Specifically regarding MPAs, 85% of the sample also either agreed or strongly agreed that they are in favour of MPAs in Malta. However, 27.5% of the sample was neutral towards whether they could do a lot to protect Malta’s marine environment, raising questions of empowerment. Furthermore, 32% of the respondents were also neutral
towards whether they want to participate more actively in marine conservation, suggesting a lack of interest in becoming involved.

Table 2

<table>
<thead>
<tr>
<th>Questionnaire Results in Percentage (%) for Attitude Statements towards Malta’s Marine Environment and MPAs (n = 200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>I appreciate the beauty of Malta’s marine environment.</td>
</tr>
<tr>
<td>I am in favor of MPAs in Malta.</td>
</tr>
<tr>
<td>An MPA would not benefit my family or community.</td>
</tr>
<tr>
<td>There is no hope for improving the marine environment.</td>
</tr>
<tr>
<td>I can do a lot to protect Malta’s marine environment.</td>
</tr>
<tr>
<td>I want to participate more actively in protecting the marine environment.</td>
</tr>
</tbody>
</table>

Attitudes towards the Delivery of Marine ESD in Malta

Exactly 91% of the respondents either agreed or strongly agreed that ESD related to MPAs is important. Furthermore, 86.5% of the sample also either agreed or strongly agreed that marine ESD should be taught in all Maltese schools. However, uncertainty exists surrounding whether the Maltese public wants to have a say in decisions related to the management of MPAs as 43.5% of the sample selected neutral. However, 67.5% of the respondents either disagreed or strongly disagreed that MPA managers should be the only ones responsible for conservation, suggesting that the Maltese public believes a wider range of people should be involved.

Table 3

<table>
<thead>
<tr>
<th>Questionnaire Results in Percentage (%) for Attitude Statements towards the Delivery of Marine ESD in Malta (n = 200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>ESD related to MPAs is important.</td>
</tr>
<tr>
<td>MPA managers should be the only ones responsible for conservation.</td>
</tr>
<tr>
<td>I want to have a say in decisions related to the management of MPAs.</td>
</tr>
<tr>
<td>Marine ESD should be taught in all Maltese schools.</td>
</tr>
<tr>
<td>ESD provided by non-formal sectors is valuable.</td>
</tr>
<tr>
<td>MPAs should be used for outdoor ESD.</td>
</tr>
</tbody>
</table>
Socio-demographic Correlations

This section of the quantitative data analysis section presents the results obtained from the Chi-squared test. This statistical test analysed the associations between four socio-demographic indicators of the questionnaire respondents (gender, occupation, age, education) and their answers to each statement. Some of the significant correlations obtained are presented in Table 4. As displayed, younger generations in Malta appear to be more familiar with the concept of MPAs but seem to value ESD related to MPAs less than the older generations. With regard to education, a higher level of education is associated to a stronger appreciation of the beauty of Malta’s marine environment as well as a stronger sense of responsibility towards protecting the marine environment. As for occupation, students were found to be least in favour of having marine ESD taught in all Maltese schools, perhaps due to a perceived increase in workload. Lastly, men were found to value ESD provided by non-formal sectors, such as non-governmental organisations (NGOs), more so than women in Malta.

Table 4
Selection of Significant Correlations Obtained from the Chi-Square Test

<table>
<thead>
<tr>
<th>Social indicator</th>
<th>Chi-squared result</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| I am familiar with the concept of MPAs. | Age | $x^2 (8) = 17,402$  
|                   |                   | $p = 0.026$ | Younger generations more familiar. |
| I appreciate the beauty of Malta’s marine environment. | Education | $x^2 (8) = 16,069$  
|                   |                   | $p = 0.041$ | Higher education linked to stronger appreciation |
| I have a moral responsibility to do my part in protecting the marine environment. | Education | $x^2 (8) = 21,741$  
|                   |                   | $p = 0.005$ | Higher education linked to stronger sense of responsibility |
| ESD related to MPAs is important. | Age | $x^2 (8) = 15,679$  
|                   |                   | $p = 0.047$ | Older generations value environmental education (EE) more |
| ESD provided by non-formal sectors is valuable. | Gender | $x^2 (4) = 11,420$  
|                   |                   | $p = 0.022$ | Men value EE provided by NGOs more than women |
| Marine ESD should be taught in all Maltese schools. | Occupation | $x^2 (8) = 20,075$  
|                   |                   | $p = 0.010$ | Students least in favor. |

Discussion

This study found that the Maltese public has limited knowledge about Malta’s marine environment and MPAs. This result may be influenced by the existing challenge to ESD in Malta presented by the prevalent colonial mentality (Mifsud, 2010). Mayo, Pace and Zammit (2008) state that this colonial mentality has led the Maltese population to narrow their view to that of ‘my home’ as opposed to ‘my environment’. As seen, 20% of the respondents were uncertain whether an MPA would benefit their family or community, pointing to a disconnected perception between that of their immediate environment and of the marine environment. Pace (2002) also pointed to Malta’s reliance on British teaching materials as a reason behind the lack of attention paid to the marine environment within existing ESD initiatives. However, 42.5% of the respondents strongly agreed that marine ESD should be taught in all Maltese schools, suggesting a strong
interest in heightening the importance given to marine ESD in Malta. With regards to the MPAs specifically, 91% of the respondents either strongly agreed (41.5%) or agreed (49.5%) that ESD related to MPAs is important. This finding is in line with that found by Trenouth et al. (2012) in Tasmania where respondents ranked “Education relating to MPAs is important” as 4.59 and 4.46 out of a scale of 5 for both study locations.

The Maltese public appears to hold a positive perception of MPAs since 85% of respondents either strongly agreed (43.5%) or agreed (41.5%) that they are in favour of MPAs. This finding is similar to that found by Thomassin et al. (2010) whereby 78% of the respondents on Reunion Island were in favour of the MPA in question. However, uncertainty appears to exist over to which extent the Maltese public believes it can and wants to be involved in marine conservation efforts. In fact, 43.5% of the sample was neutral towards wanting to have a say in decisions related to the management of Malta’s MPAs. Mifsud (2012) and Pace (1997) have both pointed to the need for increased involvement of the Maltese public within decision-making processes, and the results of this study support these claims.

Mifsud (2011) identified the need to allocate more importance to outdoor education in Malta and, as highlighted within the results, 54% of the sample agreed that MPAs should be used for outdoor ESD. Pace (2002) identified the lack of marine educational experiences for children among the Maltese islands, and therefore MPAs may present an opportunity to address this lacuna. In addition, it was found that older generations in Malta value ESD related to MPAs more than younger generations, and so utilising Malta’s MPAs to provide outdoor education experiences targeted to children may increase their appreciation of the latter.

Based on the results of the study and the analysis of literature, a model is being proposed (Figure 4). This model aims to foster a sense of ownership among the Maltese public by encouraging their involvement in the management of local MPAs. The eight recommendations embedded within the model were chosen to strengthen the relationship between ESD and MPAs in Malta by addressing existing gaps and building on opportunities. The first recommendation is for current ESD programmes in Malta to expand their scope to include the marine environment, a central component of the local environment. This process is expected to be more efficient than creating new ESD programmes targeting, specifically, the marine environment. The second recommendation is to establish a mechanism allowing stakeholders to work cooperatively towards the management of Malta’s MPAs since cooperation was identified as the preferred management approach during the interviews. The following recommendation is to address issues of implementation and enforcement surrounding Malta’s MPAs. Stakeholders emphasised the need to establish MPA rules and regulations before being able to seriously discuss associated ESD initiatives. The fourth recommendation is to create partnerships between different entities in Malta to promote and deliver ESD related to MPAs. The combined levels of knowledge, experience and resources from a variety of organisations could facilitate the delivery of ESD programmes. The next recommendation is for the University of Malta to collaborate with MPA managers to meet data collection requirements for the MPAs. Students could participate in data collection for baseline studies and monitoring, which could present financial as well as educational benefits. The sixth recommendation is to promote information about Malta’s marine environment to the public using media platforms, such as local television networks. The seventh recommendation is to explicitly include the marine environment under the National Curriculum Frame-
work (NCF)’s ESD learning area. Currently, the NCF contains ESD as a learning area for junior and secondary students but does not mention the marine environment. Lastly, Malta’s identity and heritage as an island nation should be utilised as a basis for marine ESD. This could foster an increased sense of ownership and responsibility towards the marine environment among the Maltese public. It is proposed that these actions be undertaken by a host of relevant stakeholders in Malta, including MEPA, local schools, the Centre for Environmental Education and Research (CEER), the Ministry for Education and Employment (MEDE), local communities as well as other stakeholders. The need to increase the involvement of local people in marine conservation efforts is clear, and it is hoped that the proposed model provides avenues to address this.

![Image](image.png)

**Figure 4.** Proposed model to strengthen the relationship between ESD and MPAs in Malta

**Conclusion**

This work represents a baseline study on the Maltese public’s knowledge and attitudes regarding the local marine environment and MPAs. Since the Maltese MPAs are not yet implemented, the findings can be used to inform the development of management mechanisms. Policy makers may utilise the findings to more effectively influence public awareness and to develop targeted ESD activities.

As one of the first studies examining marine ESD in Malta specifically, there are many existing areas for future research. Firstly, it would be valuable to perform a regional study of the Mediterranean region comparing people’s knowledge and attitudes towards their local marine environment and MPAs while also comparing each country’s ESD initiatives. This could shed light on the effectiveness of such programmes to inform the development of future marine ESD efforts. Within Malta, it would be important to investigate the behaviours adopted by the Maltese public towards the local marine environment as this was excluded from the scope of the present study. The results could
be subsequently analysed along various socioeconomic indicators, such as age, gender, occupation status and highest level of education. Similarly to what was done by Leisher et al. (2012), it would be interesting to assess the knowledge and attitudes of the Maltese public after the institution of formal educational activities surrounding the MPAs. Comparing the findings to this study would determine whether the ESD activities were effective in influencing the public’s knowledge and attitudes. Furthermore, it would be advantageous to evaluate future educational programmes targeting the MPAs in Malta as this would allow for adaptive management (Keene & Blumstein, 2010) and address an existing gap within the field of ESD in Malta (Mifsud, 2011).

To conclude, the study has identified a lack of marine ESD in Malta even though the Maltese exhibit positive attitudes towards the marine environment and MPAs. For a small island state like Malta, an investment in increased marine ESD efforts could lead to important benefits for both the Maltese population and its surrounding marine environment.

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Knowledge, Attitudes and Behaviour regarding Waste Management in a Grammar and a Comprehensive School in England – Results from a School Questionnaire

Karin Dorina Kolbe
University of Koblenz and Landau, Germany

Abstract
Well-organised waste management is an essential part of sustainable development. The saving of resources and energy is everyone’s concern and environmental education is vital to guarantee a sustainable lifestyle in the long run. To find out what similarities and differences in views regarding waste management exist between grammar school pupils and comprehensive school pupils in England, questionnaires were designed and distributed in two schools in the same English city. The questionnaires aimed at quantifying and establishing students’ knowledge, attitudes and behaviour regarding waste management. The results illustrate that students from the grammar school had higher levels of knowledge, were more likely to recycle and used more sources of information regarding waste management. Waste reduction was considered important by almost all students. However, students in both schools considered composting and waste reduction as less important than recycling and thereby did not fully agree with sustainable waste management.

Keywords: waste management, education for sustainable development, selective education, sustainable development, environmental education, waste management, waste hierarchy

Effective and efficient waste management is an essential part of sustainable development (Baud, Grafakos, Hordijk, & Post, 2001; Morrissey & Browne, 2004). At the level of the European Union (EU), a range of strategies to deal with waste are suggested (European Commission (EC), 1996, 2011; Pires, Martinho, & Chang, 2011; Wilson, 1996). On the societal level, education about environmental matters is vital to help achieve a more sustainable lifestyle in the long run. Primary and secondary school tuition has been identified as a key factor regarding education in general and environmental education in particular (Ballantyne, Fien, & Packer, 2001; Gross, 1977; Farmer, Knapp, & Benton, 2007). To address the particular needs of different student groups, it is essential to understand what levels of knowledge already exist in these student popu-
Knowledge, Attitudes and Behaviour regarding Waste Management...

Until now, grammar school and comprehensive school pupils have never been compared with respect to their knowledge, attitudes and behaviour regarding waste management. To find out what differences exist, questionnaires regarding waste management were distributed to students in a grammar school and a comprehensive school in the same city in eastern England. The questionnaire was designed to assess students’ knowledge, the perception which they held of different waste management options and their behaviour regarding recycling, as well as their attitudes towards waste reduction.

While some grammar schools have a long history, grammar schools that are in existence today in England and Wales are largely a product of the 1840 Grammar School Act (Gordon & Lawton, 2003; Oakland, 1993). A selection process at the age of eleven leads to students entering grammar school, who are believed to be more able than their counterparts in comprehensive schools. Admission to the grammar school depends on an academic selection test, such as the eleven plus. The eleven-plus tests arithmetic, writing and general problem solving abilities of the students. It does not cover environmental education or waste management specifically.

There has been a long debate on whether this system is useful for the individual students and society as a whole (Boliver & Swift, 2011; Clifford & Heath, 1984; Sullivan, Parsons, Wiggins, Heath, & Green, 2014). Supporters of selective education argue that it is more equitable because it selects students based upon their academic achievements instead of social class or economic power, although this hypothesis has been challenged by some researchers (Harris & Rose, 2013; Iannelli, 2013; Steedman, 2012; Walford, 1994). Also, it is believed that a stimulating learning environment is created by tutoring the stronger and weaker students in separate groups (Manning & Pischke, 2006). Critics, on the other hand, point out that educational equality decreased rather than increased as a result of selective education (Hanushek & Woessmann, 2006). Moreover, it is pointed out that a selection process at the age of eleven is too early for many children because many cognitive developments happen after this age (Manning & Pischke, 2006). Overall, grammar schools are more socially exclusive (Ball, Bowe, & Gewirtz, 1996; Crozier, Reay, James, Jamieson, Beedell, Hollingworth, & Williams, 2008; the Sutton Trust, 2005). The proportion of students with an Asian background is higher than in the general population, black students as well as students from poorer backgrounds are underrepresented (Cribb, Jesson, Sibieta, Skipp, & Vignoles, 2013). Differences between the two school types might therefore be a result not only of the different institutional backgrounds, but also of social exclusiveness. However, this must not hide the fact that knowledge of potential differences—no matter for which reasons they exist—is important. Teachers and legislators need to be aware of the different perceptions and knowledge levels to provide suitable approaches regarding education about sustainable development.

The EU Waste Hierarchy

In 2008, the EU waste hierarchy, which can be seen in Figure 1, became legally binding for EU member countries (EC, 2012). Its aims are the prevention of waste, the saving of energy and the conserving of resources (Schmidt, Holm, Merrild, & Christensen, 2007). According to the waste hierarchy, the best option regarding waste management is to avoid the production of waste in the first place. If this is not possible, waste should
be re-used since this will save a maximum of resources and energy. If neither reduction nor re-use is possible, waste materials should be recycled, composted, treated via incineration with energy recovery or – if all of these options are not possible – landfilled (European Parliament and European Council, 2008).

Figure 1. The waste hierarchy as described in the EU Waste Framework Directive.

Waste Management in the United Kingdom

In the past, a large proportion of the UK’s household waste was disposed of in landfill sites. In 2003, the UK landfilled 438 kg of municipal waste per capita – 74% of its total waste (Eurostat, 2015). Other western European countries landfilled considerably less waste in 2003. For example, Austria landfilled 30%, Belgium 11%, Denmark 7%, Germany 20%, the Netherlands 3% and Sweden 13%. The EU average was 50%. The reasons for the UK’s high landfill rate can be seen in a range of factors. A lack of public interest, the availability of cheap landfill sites, limited collection services for recyclable materials and costs associated with recycling were just a few of the reasons for this (Morris, Phillips, & Read, 1998; Price, 2001; Read, 1999; Read, Phillips, & Robinson, 1997; Symanski, 1996). As a consequence, many materials which are easily recyclable ended up on landfill sites (Popplewell et al., 2006). However, this situation has changed as a result of EU-pressure, governmental regulations and education campaigns. Today, recyclables such as paper, plastic and glass are normally treated separately from the rest of the waste stream – which resulted in a recycling rate of over 44% in 2013 (Department for Environment, Food and Rural Affairs [DEFRA], 2014). From 2015 onwards, separate collection for waste paper, metal, plastic and glass is mandatory under the Waste Regulations 2011. Relevant education campaigns in schools and elsewhere grew in number and scope (DEFRA, 2006; Waste Watch, 2015; Zhang, Williams, Kemp, & Smith, 2011).

Nevertheless, compared with its European neighbours, the UK still relies heavily on landfill for the final disposal of household waste. In 2012, approximately 172 kg – around 35% – of municipal waste was landfilled per capita. In the same year, Belgium landfilled 5 kg, Denmark – 17 kg, Germany – 3 kg, the Netherlands – 8 kg, Norway – 9 kg and Sweden – 3 kg per capita. The EU average was 160 kg per capita (Eurostat, 2015). Waste reduction – the best option to manage waste – is reflected in the national
municipal waste production statistics, as can be seen in Figure 2. Between 2003 and 2012, the amount of waste produced per capita decreased from 591 kg in 2003 to 472 kg in 2012 (Eurostat, 2015). In 2012, the UK consequently produced less waste than the average EU citizen (who produced 488 kg) but more than other EU members such as Belgium (456 kg), the Czech Republic (308 kg), Poland (314 kg) or Sweden (462 kg). Incineration with energy recovery is currently on the rise but this technology is still regarded sceptically by a large part of the population in the UK (Lima, 2004, 2006; United Kingdom Without Incineration Network (UKWIN), 2014).

Figure 2. Waste production in kilogram per person between 2003 and 2012 in the UK and the EU (Eurostat, 2015)

Research Aim

Sustainable development is an important aim and needs to be strengthened. In the area of waste management, everybody can help to achieve a more sustainable future by producing as little waste as possible and by helping to recycle and compost as much waste as possible. Schools in particular can help to achieve this aim.

Until now, it has not been analysed in how far grammar school students differ from comprehensive school students in their knowledge, attitudes and behaviour in respect to waste management. In the current study, questionnaires were designed and distributed in a grammar and a comprehensive school in the same city of eastern England to find out what similarities and differences exist between the two student populations. It is of importance to find out what teachers in different school types can do to further promote sustainable development in the long run. The research aim of the current study is therefore to identify current weaknesses in the area of knowledge, attitudes and behaviour regarding waste management in a comprehensive and a grammar school. While appropriate waste management is a vast field and education on waste management cannot cover all potential aspects of this field, teachers should be able to be aware that some areas of waste management or some waste management options need particular attention.

The basis for the analysis is the waste hierarchy as is stipulated in the EU waste framework directive. Waste reduction is seen as superior to waste re-use, re-use as superior to recycling/composting, which is seen as superior to incineration with energy recovery. Landfill is seen as the worst option for managing waste.
Method

To explore similarities and differences between students from a grammar and a comprehensive school in respect to knowledge, attitudes and behaviour regarding waste management, an explorative approach was chosen. In 2009, questionnaires were designed and piloted in different schools in England. Teachers in each of the schools where the questionnaire was tested were addressed regarding the questionnaire. Teachers cross-checked the language and the content of the questionnaire and were asked whether they considered the questions appropriate for the school type and the age of the questioned students.

After piloting the questionnaire, a range of questions were rephrased or changed completely to take into account the level of knowledge of the students. In general, students over the age of 11 understood the questions well. Younger students often had problems with some of the questions. The questionnaire was then distributed in two schools in the same city in England. The city is situated in the east of England and has a population of around 100,000. The city was chosen because teachers in both schools – the comprehensive and the grammar school – were supportive of the research aim and agreed to participate in the questionnaire.

Obtaining information from multiple choice and open-ended questions on waste management, attitudes regarding waste management options and behaviour in the area of waste recycling were objectives of the questionnaire. Students were also asked where they gained their waste-related knowledge from.

Specifically, the part of the questionnaire which is analysed in this paper consisted of seven questions. Question 1: Below is a list of issues. Please tick the relevant box to indicate how much you know about the different issues. A list of concepts was provided. Students could choose between the answer options: I have never heard of it; I have heard of it but I don’t know what it means and I have heard of it and I know what it means.

Question 2: Please indicate how important on a scale, you find the issues listed below (10 = very important and 1 = not at all important). Students were asked how important different waste-related waste management options (reduce the amount of waste, recycle waste, compost organic waste and re-use waste) appear to them.

Question 3: Do you think we should reduce the amount of household waste or rubbish? If you think we should not reduce it, please tell us why. If you think we should reduce it, please also tell us why.

Question 4: If you do recycle, please tell us which materials you recycle and how often. Students could choose between “whenever possible”; “at least once every month”; “at least twice a year”; “almost never” and “other (please specify)”. For the purpose of the analysis, “at least once every month” and “at least twice a year” were summarised as one category which is called “sometimes”.

Question 5: A list of materials is provided below. Please circle the materials that can be recycled.

Question 6: If you know what incineration is, please tell us if you think that it is a good way of treating waste. The answer options were: Yes it is, because...; No, it isn’t, because...; It can be if... and I don’t know. Students could then explain their viewpoint.

Question 7: Where did you get your waste related knowledge from? A list of potential sources was provided.

Participating pupils were between 13 and 14 years of age. 110 students were surveyed in the grammar school and 143 in the comprehensive school. The questionnaires were
filled out anonymously in class. The same researcher handed out the questionnaires in both schools on different days of the same month. The researcher highlighted that there are no right or wrong answers, that the questionnaire and the answers to the questions were completely anonymous and that copying of neighbours was therefore not necessary. Teachers were advised to not provide any help in cases where students were unsure about a question.

Quantitative and qualitative analyses were carried out. For the quantitative analysis, the statistical software package SPSS and Excel were used. Answers to multiple choice questions were analysed by providing cross-tabulation and calculating frequencies to allow direct comparison between the two student groups. Open-ended questions were grouped into categories so as to be able to compare them relatively easily. For instance, answer options such as *Incineration is bad because it pollutes the air* and *Incineration is bad because it leads to exhaust gases* were compiled in the section *Incineration leads to air pollution*. The answers were also compiled into categories by another researcher from the same department. In some cases, this researcher compiled the answers slightly differently and used more categories. Where there were discrepancies regarding categories, instead of combining them, more categories were created. Answers which were only given by one student were compiled under a specific section which is called *Other*.

**Results**

Question 1: Different waste-related concepts were provided, and students were asked whether they were aware of these concepts. The results can be seen in Table 1. Overall, students from the grammar school were more likely to state that they “had heard about” the particular concepts and “knew what it meant”, whereas comprehensive school students often stated that they had not heard of a concept or did not know what it meant. For instance, over 11% of the students from the comprehensive school had not heard about incineration and over 15% had never heard of landfill.

<table>
<thead>
<tr>
<th></th>
<th>Have never heard of it</th>
<th>Have heard of it/ don’t know what it means</th>
<th>Have heard of it/ know what it means</th>
<th>Missing answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammar school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerbside collection</td>
<td>0.0</td>
<td>3.5</td>
<td>0.9</td>
<td>99.1</td>
</tr>
<tr>
<td>Composting</td>
<td>0.0</td>
<td>4.9</td>
<td>10.9</td>
<td>89.1</td>
</tr>
<tr>
<td>Incineration</td>
<td>0.9</td>
<td>11.2</td>
<td>19.1</td>
<td>80.0</td>
</tr>
<tr>
<td>Landfill</td>
<td>1.8</td>
<td>15.4</td>
<td>13.6</td>
<td>84.6</td>
</tr>
<tr>
<td>Comprehensive school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerbside collection</td>
<td>0.0</td>
<td>4.9</td>
<td>10.9</td>
<td>89.1</td>
</tr>
<tr>
<td>Composting</td>
<td>0.0</td>
<td>5.6</td>
<td>1.8</td>
<td>98.2</td>
</tr>
<tr>
<td>Incineration</td>
<td>0.9</td>
<td>11.2</td>
<td>19.1</td>
<td>80.0</td>
</tr>
<tr>
<td>Landfill</td>
<td>1.8</td>
<td>15.4</td>
<td>13.6</td>
<td>84.6</td>
</tr>
</tbody>
</table>
Question 2: Students were asked how important different waste management options appear to them on a scale from 1 to 10. The arithmetic means (which are provided in Table 2) indicate that the order of importance (given in brackets) is the same between grammar and comprehensive school students. However, grammar school students rated all concepts as more important than the comprehensive school students.

Table 2

<table>
<thead>
<tr>
<th>Concept</th>
<th>Grammar school</th>
<th>Comprehensive school</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the amount of waste</td>
<td>8.39 (2)</td>
<td>7.76 (2)</td>
</tr>
<tr>
<td>Recycle waste</td>
<td>8.6 (1)</td>
<td>7.93 (1)</td>
</tr>
<tr>
<td>Compost organic waste</td>
<td>7.58 (4)</td>
<td>6.18 (4)</td>
</tr>
<tr>
<td>Re-use waste</td>
<td>7.97 (3)</td>
<td>6.91 (3)</td>
</tr>
</tbody>
</table>

Question 3: When asked whether students thought that waste volumes should be reduced, all students in the grammar school and all students – except one – in the comprehensive school stated that waste should be reduced. The comprehensive school student that did not find a reduction of waste important stated that it would be “bad for recycling companies” whereas all the other students named primarily environmental reasons for the reduction. Limited landfill capacity, global warming and environmental pollution were the reasons most often named by both, grammar school students and comprehensive school students, for a reduction of waste. Around 10% of the grammar school students also named the saving of resources as a reason. This aspect was only named by 3.4% of the comprehensive school students. Overall, the answers given by the grammar school students and the comprehensive school students did not show large differences.

Question 4: When asked about recycling behaviour, there is a clear difference between grammar school students and comprehensive school students. The former recycled more often “whenever possible” while the later recycled “almost never” or left the answer blank, as can be seen in Table 3.

Question 5: Asked about whether they knew which materials could be recycled, grammar school students more often classified materials correctly as recyclable, as can be seen in Table 4. Tetra Paks were the only material which was more often classified correctly by comprehensive school students compared to grammar school students. The same percentage of students in the grammar and the comprehensive school classified PET bottles correctly.
Table 3
Percentage of Students who Stated that they Recycled Whenever Possible, Sometimes or Almost Never

<table>
<thead>
<tr>
<th>Material</th>
<th>Whenever possible</th>
<th>Sometimes</th>
<th>Almost never</th>
<th>Missing answer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grammar school</td>
<td>Comprehensive school</td>
<td>Grammar school</td>
<td>Comprehensive school</td>
</tr>
<tr>
<td>Paper</td>
<td>88.2</td>
<td>70.6</td>
<td>10.9</td>
<td>10.5</td>
</tr>
<tr>
<td>Cans</td>
<td>69.1</td>
<td>55.2</td>
<td>16.4</td>
<td>12.6</td>
</tr>
<tr>
<td>Glass bottles</td>
<td>72.2</td>
<td>55.2</td>
<td>14.5</td>
<td>16.8</td>
</tr>
</tbody>
</table>

Table 4
Percentage of Students who Classified the Named Materials Correctly as Recyclable

<table>
<thead>
<tr>
<th>Materials</th>
<th>Correct answer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grammar school</td>
</tr>
<tr>
<td>Paper</td>
<td>99</td>
</tr>
<tr>
<td>Glass</td>
<td>97</td>
</tr>
<tr>
<td>Fruit juice cartons (Tetra Paks)</td>
<td>46</td>
</tr>
<tr>
<td>Plastic bottles (PET bottles)</td>
<td>84</td>
</tr>
<tr>
<td>Drink cans</td>
<td>93</td>
</tr>
<tr>
<td>Cardboard</td>
<td>96</td>
</tr>
<tr>
<td>Aluminium Foil</td>
<td>44</td>
</tr>
</tbody>
</table>

Question 6: Students were also asked whether they considered incineration as a good technology to treat waste, a potentially good technology to treat waste if certain criteria are met, not a good technology to treat waste, or whether they were unsure if incineration is a good technology for the treatment of waste. Students were also asked to provide reasons for their judgement.

The answers can be seen in Table 5. Grammar school students were more likely to have an opinion about incineration. They more often stated that it is not a good technology for the treatment of waste and were also more likely to consider it a potentially good technology if certain criteria are met. Students who thought that it could potentially be a good technology normally named the containment of fumes, the recovery of energy and the limitation of the technology to materials which cannot (easily) be recycled. Students who disapprove of incineration considered it harmful to human health and the environment.

Overall, students from the comprehensive school were more likely to have no opinion about incineration, either by ticking I do not know whether it is a good technology for the treatment of waste or by leaving the answer to the question blank. Over 50% of the students answered the question in this way.
Table 5

*Impression that the Students from the Grammar and the Comprehensive School had about Incineration*

<table>
<thead>
<tr>
<th>Answers (%), Technology</th>
<th>Grammar school</th>
<th>Comprehensive school</th>
</tr>
</thead>
<tbody>
<tr>
<td>A good technology for the treatment of waste</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Not a good technology for the treatment of waste</td>
<td>44</td>
<td>29</td>
</tr>
<tr>
<td>A potentially good technology if certain criteria are met</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>I do not know whether it is a good technology</td>
<td>18</td>
<td>26</td>
</tr>
<tr>
<td>No answer given</td>
<td>16</td>
<td>27</td>
</tr>
</tbody>
</table>

Question 7: Finally, students were asked from where they gained their knowledge of waste related subjects. Around 80% of the students from the grammar school stated that they received their knowledge from school, compared to around 50% of the students from comprehensive school. Grammar school students were also more likely to receive their knowledge from their families. Around 90% stated that this was one source of their information compared to 70% of the comprehensive school students. At the same time, grammar school students were also more likely to receive their information from friends (40% compared to 20%), magazines (25% compared to 19%), television (83% compared to 68%) and the Internet (44% compared to 25%). Hence, they were overall more likely to receive information from the named sources and more likely to use different information resources.

**Discussion**

Overall, grammar school students had higher levels of knowledge and were more likely to recycle materials. They also rated different waste management options (reduction, re-use, recycling and composting) as being of higher importance compared to the students from the comprehensive school. However, the order of importance was the same between students from the grammar school and students from the comprehensive school. Both student groups considered recycling as most important, followed by waste reduction, re-use of waste and finally by composting. According to the waste hierarchy and national policy, waste reduction is the best option, followed by re-use and then recycling/composting. It should be easy to see that reduction is the most sustainable option: it leads to a maximising of resources and energy savings. It is therefore surprising that students did not rate it as the most important of the proposed options.

Interestingly, students do not feel that recycling and composting are equally important, although the treatment hierarchy sees these two approaches as being of equal importance. Both recycling and composting divert waste efficiently away from landfill. In the case of compostable materials, this is of particular environmental importance because organic fractions lead to the release of methane when put on landfill sites and thus exacerbates global warming. The students surveyed, however, clearly favoured recycling over composting, which might indicate a lack of knowledge regarding the lifecycle of organic fractions that end up on landfill sites.

In respect to students’ attitudes regarding landfill, grammar school students and comprehensive school students were equally likely to dislike the technique for environ-
mental reasons. Equally, almost all students from both schools stated that waste should be reduced for environmental or social reasons; this is in accordance with the waste hierarchy.

Incineration was overall regarded sceptically by the majority of the students. Grammar school students were more likely to voice their dislike for the technology or to connect it to factors such as energy recovery, filtration technologies or the limitation to materials which cannot (easily) be recycled. Students from the comprehensive school were more likely to have no opinion about incineration, illustrating the need for more specific information to be provided in comprehensive schools regarding this technology. In general, students should be aware that incineration is currently used and that it can help to reduce landfill volumes. However, students should also be aware that waste reduction, re-use, recycling and composting are more sustainable compared with incineration. Only if the advantages and disadvantages of incineration are known will students be able to judge the technology realistically. Around 50% of the comprehensive school students and over 35% of the grammar school students seem to lack this knowledge.

When it comes to recycling behaviour, grammar school students outperformed their counterparts from comprehensive school. They were more likely to recycle paper, glass and cans “whenever possible”. Whether this is a result of higher levels of knowledge remains unclear. Family background, personal values and household infrastructure clearly also play a role, as has been shown by a range of researchers (Best & Mayerl, 2013; Edgerton, McKechnie, & Dunleavy, 2009; Kaciak & Kushner, 2009).

Overall, grammar school students had higher levels of knowledge and showed a more environmentally friendly attitude compared to comprehensive school students. It can therefore be assumed that they are more environmentally concerned and better educated regarding waste management. Both might lead to them recycling more often. Comprehensive school students surprisingly often stated that they had not heard about some of the named waste management options or that they did not know what they meant. This lack of knowledge needs to be addressed at school since only knowledgeable students will make the right choices when it comes to waste management behaviour. Overall, comprehensive school students were less likely to receive their information from different sources such as their family, friends, television or the Internet. To compensate for these shortcomings, schools need to put particular emphasis on waste related issues. At the moment, only 50% of the comprehensive school students stated that they received their knowledge about waste management in school. In this area, comprehensive school teachers can clearly increase information flow by highlighting the benefits, needs and possibilities of waste management options on the regional, the national and the global level. While knowledge alone is not sufficient for behavioural changes, it is a necessary precondition. Equally, the large proportion of students who had no opinion about incineration should be addressed since it will lead to young adults that are unaware of the possible benefits and drawbacks of incineration technologies. They are therefore more prone to manipulation by pressure groups. In a country where incineration plants are currently widely used, built and also have much opposition, it is essential that students are aware of the possibilities (as well as the limitations of incineration) and that they are able to reflect rationally on this technology.

Education can help to minimise these shortcomings by providing neutral information on waste management options. While this might not necessarily enhance recycling beha-
viour, it can help to increase the willingness to examine one’s personal behaviour more thoroughly. Only if people are knowledgeable about waste management possibilities, such as composting, kerbside collection services or recycling, will they be able to participate in, or decide among these options.

Overall, the questionnaire also showed that the differences between grammar and comprehensive school students are primarily one of intensity, not of general attitude. Recycling is seen as very important by students from both schools. All students except one thought that waste should be reduced and most students stated that they recycled at least sometimes. These tendencies are clearly positive and illustrate that the basis on which a further improvement of environmental factors associated with waste management is possible. However, waste reduction was not judged as being the most important waste management approach. Instead, recycling was seen as more important by students of both school types. This is not in accordance with the waste management hierarchy and contrary to sustainable development. Equally, composting was rated as being of less importance than recycling, reduction and re-use, although composting is as important as recycling. Both technologies divert waste efficiently away from landfill. Teachers of both school types should therefore highlight the environmental benefits of waste reduction compared to waste recycling as well as the importance of composting, a technique which every student can relatively easily apply at home if knowledge on how to do it and to the motivation to do it exists.

Conclusions and Future Research

For the first time, the current study showed that there are differences between grammar school students’ and comprehensive school students’ knowledge, attitudes and behaviour regarding waste management. Grammar school students had higher levels of knowledge, considered different waste management options as more important, and were more likely to recycle their waste. The shortcomings of comprehensive school students need to be addressed by teachers of all disciplines to enhance the likeliness of these students to participate in recycling and composting schemes and to be able to make educated decisions regarding waste management options. Moreover, there is a need in both schools to highlight the importance of waste reduction and waste re-use compared to recycling. Waste reduction and waste re-use are the best options when it comes to waste management. Both approaches minimise the negative environmental impacts and poor resource use associated with waste. Communicating this to young people is essential to influence their lifestyle choices in the long run.

It will be necessary to find out why students considered waste reduction as less important than recycling. Possibly, the weight which is put on recycling has led some students to believe that waste reduction is no longer necessary. Alternatively, waste reduction might be seen as inconvenient compared to recycling. Future research should therefore address these questions and should try to identify educational options that can help to increase students’ willingness to participate in pro-environmental waste management options.
Knowledge, Attitudes and Behaviour regarding Waste Management

References


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Environmental Education in Pre-Service Teacher Training: A Literature Review of Existing Evidence

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University of the Balearic Islands, Spain

Abstract
The importance of pre-service teacher training regarding environmental education (EE) has been vastly demonstrated. This systematic review examined the existing evidence from studies evaluating and analysing the relationship between EE, including environmental competences and pre-service primary school teacher training. The literature review performed included 24 documents (22 peer reviewed journal articles and two doctoral theses). The strategy followed consisted in locating documents by a reliable search strategy; establishing the criteria for the selection of documents to analyse from the documents located and rigorously analysing the documents selected based on clear and precise criteria and dimensions. In general terms, the literature review analysis has emphasised the lack of environmental competences amongst pre-service teacher students and the gaps in the teacher training curriculums regarding EE. The overall scarcity of research in this area, jointly with certain gaps and methodological limitations, affirms the need for strengthening the evidence base.

Keywords: environmental education, pre-service teacher training, education for sustainable development, environmental competencies, literature review

Teacher training, whether pre-service or continuous professional development, is an essential element to introduce environmental education (EE) in schools. The need for and relevance of this training was already made explicit in the major EE conferences held by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in the 1970s and 1980s (UNESCO, 1975, 1977, 1987). As a result of this interest and of the international consensus arising from it, UNESCO published a set of experimental modules on pre-service and continuous teacher training throughout the 1980s and 1990s, some examples of which are the works of Fensham, Hunwick and Jacobson (1986), Marcinkowski, Volk and Hungerford (1990), Sinha, Jangira and Das (1985), Wilke, Peyton and Hungerford (1987).

In 1990, UNESCO/UNEP identified this training as the ‘priority of priorities’ for improving EE. Along the same lines and in the same decade, other conferences and international agreements on the issue once again highlighted the need to reorient teacher
Environmental Education in Pre-Service Teacher Training.

training in order to promote sustainability (UNESCO, 1997; United Nations (UN), 1992). In 1999, UNESCO created the UNITWIN/UNESCO Chair for Reorienting Teacher Education to Address Sustainability, whose goal was to take leadership in developing an international pilot network among existing teacher training institutions and facilitate and coordinate its work (UNESCO, 1999). Emanating from the UNESCO World Conference on Education for Sustainable Development (2009), what became known as the Bonn Declaration (UNESCO, 2009), called for efforts to be directed to reorient curriculum and teacher education programmes to integrate ESD into both pre-service and in-service programmes.

Numerous documents have analysed the situation of EE over the years and shown the need for teacher training in this field. In France, for example, a report commissioned by several ministries to develop a future strategy for sustainability notes that ESD cannot be carried out effectively without supporting teacher training efforts (Bregeon, Faucheux, & Rochet, 2008). Similarly, an earlier report suggests that teacher training is a necessary requirement for successful education in this area (Bonhoure & Hagnerelle, 2003). Furthermore, the need for this type of training is highlighted in some research conducted within higher education. The incorporation of ESD into the curricula of pre-service teacher training ensures the promotion of sustainability amongst future citizens. This education could be promoted through the teaching of science (Madhawa Nair, Rashid Mohamed, & Marimuthu, 2013), scientific experimentation (Karpudewan, Ismail, & Mohamed, 2009) and initiatives (Henze, 2000) related to Agenda 21 (UN, 1992). However, a case study conducted in five faculties of education in Manitoba Canada noted that, despite the relevant efforts made for the integration of this education into pre-service teacher education institutions, ESD has been poorly incorporated into the curriculum (Falkenberg & Babiuk, 2014). This context, or lack of, invites us to wonder about the state of the art in pre-service teacher training regarding EE. It is important to be acquainted with the evidence and the existing body of knowledge in this area, not only for the construction of cumulative scientific knowledge, but also to support opening new areas of inquiry.

Objectives

The aim of this study is to undertake a review of published scientific literature on pre-service primary teacher training (PsPTT) regarding EE. This involves locating, classifying and analysing research conducted on the topic. This study concentrates on describing peer-reviewed journal articles and dissertations on the topic, and answers the following questions:

- What are the main topics discussed on PsPTT regarding EE?
- What are the main outcomes, evidences and findings of the works analysed?
- What are the implications of the outcomes and conclusions of the works analysed?

Meta-Analysis Procedure

For a systematic review of the documents, a number of stages were followed that can roughly be summarised into the following three: locating documents by the use of a consistent search strategy; establishing the criteria for the selection of documents to be
considered from the set of documents found and, finally, analysing these rigorously selected documents based on clear and precise criteria and dimensions (Higgins & Green, 2011).

The peer-reviewed journal articles were located by consulting major scientific databases: ERIC, Web of Science, SCOPUS, REDINED and Dialnet (Spanish databases). Doctoral theses were located by the use of three databases: ProQuest Dissertations & Theses Database (PQDT), Dart-Europe and Tesis Doctorales en Red (TDX). Although the authors are aware of the existence of other types of documents that could also have been analysed (research reports, books and book chapters, conference proceedings, etc.), the review was limited to academic papers published in peer-reviewed journals and doctoral theses, as both have been subject to rigorous review and are, therefore, high-quality documents.

The search strategy was based on systematically organising, categorising and selecting keywords related to EE and pre-service teacher training. To do this, a word search was conducted in the ERIC thesaurus, in English, in relation to the terms training, EE, education for sustainable development (ESD), primary teachers, pre-service teacher training and university. Using these keywords, a common search strategy was developed for the various databases consulted, adapting it to the characteristics of the given platform. For each database, a hierarchical search strategy was applied, starting from the most complex form to the simplest expression, with the aim of retrieving documents from all databases. Depending on the requirements of each database, the search fields were basically limited to the title and abstract of the documents, with consideration of all those published until 2014. In each database, various refined search strategies were employed for consistency purposes, such as solely locating peer reviewed papers in ERIC or only selecting papers in Web of Science, for example.

After obtaining the document records, those to be analysed were identified. The following criteria were used for the screening process:

a) eliminating the records of documents that do not specifically refer to EE in PsPTT;

b) eliminating duplicate records;

c) eliminating those documents that could not be accessed.

Regarding content, the concepts used and the main issues involved in the relationship of PsPTT with EE/ESD were analysed, together with the main results and conclusions. Those paragraphs referring to EE in PsPTT were selected from the documents to determine the units for analysis.

In order to ensure the reliability of the process, the three members of the research team conducted the selection of information units, the categorisation and subsequent analysis independently. Fieldwork associated with locating of documentation, was performed during October, November and December 2014; the processing, analysis and data mining took place during January and February 2015.

Results

From the content analysis, the documents can be broadly categorised along four areas:

a) analysis of the research on EE in PsPTT;

b) analysis of the research on training experiences in EE and ESD;
c) proposals for models of EE in PsPTT;
d) integration of EE/ESD into the curriculums of PsPTT qualifications.

Evaluation of EE in PsPTT

Nine studies were included in this category, which evaluated EE in pre-service teacher training by analysing several variables. Miles, Harrison and Cutter-Mackenzie (2006) analysed the perceptions and experiences regarding EE of students enrolled in the second and third year of a teacher training faculty of an Australian university. This involved conducting a focus group on a sample of seven students to determine the encounters those future teachers had with EE during their training courses. From this information, the researchers designed a questionnaire to evaluate the experiences in connection with EE of a sample of 131 students, their knowledge of the discipline and where this knowledge had been obtained and their views on their preparation for EE teaching. This survey data shows that 50.3% of students indicated that most of their relationship with EE had occurred during classes and rarely in their school practices (28.9%). Likewise, the assessment that the students themselves performed on the teaching of EE, measured on a scale from 1 (low) to 5 (high), suggested that students were reasonably interested in the teaching of EE (average of 3.3), but that their knowledge of EE and their preparation to teach it was inadequate (average values of 2.5 and 2.3, respectively). According to these results, the authors concluded that “there are still inadequate levels of EE provision at the teacher education level and pre-service primary teachers’ preparedness for teaching EE is overwhelmingly low” (Miles, Harrison, & Cutter-Mackenzie, 2006, p. 57).

To determine the level of environmental competences acquired by pre-service teachers, the following characteristics were analysed in several studies: their knowledge, attitudes and their environmental behaviour and their environmental literacy. Examples of the first category include the works carried out by Boon (2010), Puk and Stibbards (2010), Tal (2010). In Boon (2010), the knowledge about climate change was evaluated by using a sample of pre-service primary, secondary and early childhood teachers in the final year of their degree programme (n = 107). Of this sample, 56 participants were future primary school teachers. The administered questionnaire examined their knowledge and ideas about the greenhouse effect and the ozone layer hole, the sources from which they had obtained this knowledge and the actions that they were willing to take to mitigate their environmental footprint. The results were compared with a sample of 310 secondary school students. No significant differences were found between students and pre-service teachers regarding aspects such as understanding the greenhouse effect and the function of the ozone layer. The future teachers only seemed to be better informed about these phenomena because they had a greater interest in gathering information through the media. The study conducted by Boon (2010) highlighted the need to develop curricula to overcome gaps in knowledge and the understanding of the specific items in the school curriculum and the need to include them in the training of teachers. Meanwhile, Tal (2010) utilised a questionnaire on environmental issues at the beginning and end of an introductory course in EE for pre-service teachers at a university in Israel. The questionnaire aimed to assess participants’ knowledge of environmental issues and their reflections on the course itself. The environmental knowledge of the 75 students surveyed was very poor at the beginning of the course, but had improved by the end of it. In
relation to the opinions expressed about the course itself, the students indicated that the course had provided them with new knowledge about environmental matters, improved their environmental awareness and allowed them to discover new teaching methods for their practice. Consequently, it was suggested that courses on environmental issues should be introduced in teacher training curricula in order to overcome the low level of environmental knowledge and improve environmental literacy. Finally, Puk and Stibbards (2010) analysed the definitions of several concepts used to evaluate the ecological knowledge of 15 pre-service teachers in Ontario, Canada. The results revealed a lack of understanding of core concepts about how natural systems work and the impact of social systems on natural systems; however, these concepts were considered essential for the training of future teachers and their ecological literacy. It was concluded that it is necessary to incorporate specific training on ecological literacy into PsPTT programmes.

The results of the three studies described a low level of environmental knowledge of pre-service teachers and highlighted the need for EE training for these future educators by including this discipline in pre-service teacher training qualifications. However, despite this limited knowledge, some research suggests that student teachers have positive attitudes towards EE. Kyridis, Mavrikaki, Tsakiridou, Daikopoulos and Zigouri (2005) administered a questionnaire that assessed attitudes towards EE of 76 primary school student teachers and 96 kindergarten student teachers after completion of a six-month EE course. The dimensions of analysis covered: the methodology used in EE; the role of EE in the curriculum; objectives and issues addressed by EE and the relationship between students and EE. The analysis of the data revealed that most participants had positive attitudes towards EE in their role as students, although their attitudes were more negative when compared to their future role as teachers. Likewise, students believed that EE would help them to become acquainted with more innovative teaching methods and to improve teacher-student relationships. In conclusion, the authors emphasised that the major responsibility of the university is to promote interest in environmental issues among their students in order to enable them to not only look for solutions to environmental problems, but also to be professional promoters of sustainability.

Goldman, Yavetz and Pe’er (2006) conducted a longitudinal study among student teachers in three universities and teacher training centres in Israel at the beginning and end of their studies to assess their level of environmental literacy. In the first study, the sample consisted of 765 new students at the beginning of their degree programme. The instrument used was a questionnaire that analysed environmental knowledge, attitudes and behaviour. The environmental behaviour scale consisted of 20 items with environment-related activities, in which respondents were asked to rate the frequency they carried out those activities, using a five-point Likert scale (1 = never to 5 = almost always). The results showed a low level of environmentally responsible behaviour of students (total mean value of 3.19), which may be related to a low level of environmental literacy. In addition, there were significant differences between students of the areas of sciences and social sciences, with the former showing better environmental behaviour. Subsequent studies (Goldman, Yavetz and Pe’er, 2014) compared the differences in environmental literacy between these same students by considering a sample of 214 students in relation to the area of specialisation that they studied: environmental or non-environmental. Results confirmed that there were significant differences between the two groups in certain aspects and in some characteristics of their environmental behaviour and basic environmental knowledge. The authors recommended including at least one specific EE
course in the degree programme for non-environmental specialists or including it as a component of a subject. When they analysed the understanding of the concept of environment among the participants, they found that students recognised that EE was important for their future teaching role, but these participants did not demonstrate an adequate understanding of the concept of environment. Consequently, the authors state that “all student teachers should receive appropriate preparation in this field... EE [should] not be limited to science disciplines; rather it should be included in all teacher education programs” (Yavetz, Goldman, & Pe’er, 2014, p. 370). Also, in this line of inquiry, a study conducted in Turkey (Tuncer, Boone, Tuzun, & Oztekin, 2014) applied a specific method to measure the environmental literacy of pre-service student teachers in four universities in Ankara. The questionnaire was administered to a sample of 2,311 students and consisted of four components of environmental literacy: knowledge, attitudes, attitudes towards environmental responsibility and concern. The authors concluded that students were concerned about the issues that affect their personal lives in the short term, but were not able to establish relationships between environmental problems and factors, such as their level of consumption, because of their low EE knowledge. The analysis of the different variables led these authors to claim that future teachers have a low level of environmental literacy.

As a summary of this section, we can point out that research carried out suggests that prospective teachers acquire low levels of environmental competences and basic environmental knowledge during their higher education training, although they tend to have positive attitude towards EE and ESD.

Evaluation of Training Experiences in EE and ESD

A total of nine studies focused on analysing the effectiveness of models, programmes, courses and methodologies implemented in order to train future primary teachers in teaching EE/ESD. These are a series of empirical studies centred on specific experiences that seek to improve the knowledge and teaching methodologies in EE among pre-service teachers.

In 1976, Bluhm and Hungerford applied a model to introduce EE and the concepts of ecology to all pre-service elementary teacher students at the University of Southern Illinois, USA. To assess the conception of EE, the definition of EE held by the students was quantitatively assessed; to assess the notions of ecology, a 17-item multiple-choice and short-answer questionnaire was developed regarding some ecological concepts. The instrument was administered at the beginning and end of the course to a sample of 44 students in the experimental group and 16 students in the control group. The results indicated that the model applied significantly influenced the perception of EE. Likewise, the application of the model allowed the concepts of ecology to be acquired in a short period of time. In a model subsequently developed (Gayford, 2004) for pre-service teachers in relation to education for sustainability, the inclusion of EE in the science curriculum of future primary teachers was planned and evaluated. Pre-service teachers who applied this model to their practice considered that, in general terms, it was a successful model that had allowed them to see how they could contribute to this area of education through their specialisation. The model proposed by Summers, Childs and Corney (2005) is also worth noting in connection with ESD. These authors proposed integrating ESD in schools by adopting an interdisciplinary approach into the subjects
of the pre-service primary teachers’ curriculum. To do this, they evaluated the way in which this education was implemented by administering questionnaires to geography and science student teachers, their tutors in schools and the principals of the schools in which teaching practice was held. The analysis of results showed that the schools were not prepared as a learning context to address sustainability from an interdisciplinary viewpoint, and that the understanding of sustainability by both student teachers and their mentors was not pertinent for its application in the classroom.

PsPTT on environmental issues has also been conducted through specific courses and methodologies, which have shown positive results among future teachers. A case study analysed the training received by a group of student under the umbrella of environment and school initiatives (Varga, Köszö, Mayer, & Sleurs, 2007). Participants were evaluated as they followed a process for the introduction of ESD in the classroom during their teaching practice. Results showed the feasibility of the experience of improving skills in sustainability among these teachers. Van Petegem, Blieck and Pauw (2007) evaluated the implementation process of EE in two Flemish teacher education colleges: one college had a long history of integrating EE into its training programme, while the other did not. To analyse the results of the experience, the views of the teaching faculty responsible for the implementation of EE in the degree and the opinions of the students about the training were evaluated. It was noted that, despite the fact that specific courses in EE were integrated into the curriculum for pre-service teacher education of both universities, environmental issues were usually presented in specialist science courses, namely biology and earth sciences. For students trained in EE, the courses were a good curricular tool and allowed them to work in an interdisciplinary way, but their environmental awareness and environmental responsibility diminished rapidly after the courses, which makes clear the need for on-going EE training. No major differences were observed in the results of the two institutions regarding their background in the implementation of EE, as the implementation process was problematic in both cases due to the teaching faculties’ lack of EE training skills, their difficulty in engaging in teamwork and the differences between the different areas of education.

The method implemented by Kiliné (2010) sought to encourage pro-environmental behaviour among pre-service primary student teachers in a Turkish university. 33 students in the sample took an Environmental Sciences module in which they applied a working methodology that involved undertaking different action research projects in relation to some environmental topics and didactic methods used. The effectiveness of the method was evaluated by using both qualitative and quantitative techniques by administering a questionnaire at the beginning and at the end of the courses. Data showed that the environmental behaviour of students improved after the course; the average values of their behaviour ranged from 3.76 to 6.27, measured on a scale of 1 to 8. Improvements were also noted in the environmental behaviour of students after carrying out some environmental projects. Based on the results of this study, authors suggested that this methodology should be applied in PsPTT in order to change students’ beliefs about EE and encourage them to behave more pro-environmentally and serve as an example to their future students.

The doctoral thesis of Cardona (2012) is another example of an EE training experience. The research was conducted amongst undergraduate science students of primary education from the University of Antioquia, Colombia, who were still in PsPTT but were already working in primary schools. Data were collected through questionnaires,
written documents and interviews with 12 participating teachers and analysed qualitatively. From the results, it was suggested that student teachers lacked sufficient knowledge and skills to build proposals for EE in the classroom and that this was a gap in their training.

The studies conducted in two Swedish universities by Andersson, Jagers, Lindskog and Martinsson (2013) were identified as examples of ESD training. These consisted in evaluating the effects of an ESD course on student teachers. The comparative study examined the beliefs, attitudes and moral obligations towards sustainability by the use of a questionnaire that was administered at the beginning and end of an ESD module. The sample included a control group composed by 97 students that did not follow the module and an experimental group of 323 students who were taking the ESD course. Changes in beliefs and moral standards were measured by the use of a Likert scale, which showed increased positive averages for the experimental group in most measured beliefs, while no effects were observed in the control group of students. The study also assessed whether teachers who had shown a greater interest in environmental issues at the start of the study had experienced greater changes, with no significant differences being observed. The authors concluded that participation in this course by student teachers could help to promote sustainability among future educators.

The experiences in Spain include the study carried out on the Primary Education Teaching Degree at the University of Girona (Junyent, 2002). This doctoral thesis analysed the impact of a cooperative work methodology applied to one EE module. Qualitative techniques were used to analyse the reflections of the 42 pre-service teachers participating in the study. The analysis of the data showed that the methodology had positive effects on student teachers to incorporate environmental considerations into their teaching (Junyent, 2002).

Summarising this section, we can indicate that there is a lack of environmental competences amongst the future teacher’s trainers at the universities and higher education institutions, and that the most appropriate methodologies to work EE and ESD amongst PsPTT students are based on collaborative, interdisciplinary and experiential activities.

Proposals of Models for The Training of Teachers in EE/ESD

In four of the studies analysed, programmes for PsPTT in EE/ESD were described and evaluated. Since the 1980s an obvious need has been identified to orient training in this area through models that would improve the ability of teachers to educate socially and environmentally responsible citizens. Some models, such as that proposed by Caduto (1985), indicated that student teachers should be trained to implement an education that promotes what he describes as environmental values. This could be gained through (i) philosophical values; (ii) values of nature and social dynamics; (iii) methodologies for implementing this kind of values education based on moral development, analytical skills, active learning, changes in behaviour, etc.; (iv) communication skills and (v) knowledge of the nature of environmental values education in the context of formal and informal education institutions. A similar model was proposed by Wilke (1985) based on an experiment conducted at the University of Wisconsin, United States. According to the author, teachers must acquire some environmental competencies, and, subsequently, EE training is a requirement for the successful completion of the degree. These competencies include that student teachers should be able to (i) apply the knowledge of
the philosophy of education in the curricula to be developed, as well as in the strategies used, to achieve the general objectives of education and EE; (ii) use existing theories linking knowledge, attitudes and behaviour for the selection, development and implementation of a curriculum that maximises the probability of causing behavioural changes in the students; (iii) teach students about the transfer of learning to ensure that the promoted skills are included in the daily lives of students. In a later piece of research, Stone (1989) reaffirmed the guiding strategies of UNESCO (Wilke, Peyton, & Hungerford, 1987) on the EE competencies that teachers should acquire in order to act appropriately and effectively in the classroom. These competencies refer to the knowledge and the ability to implement EE in the school curriculum and the knowledge about ecology and environmental issues that teachers should possess. In order for EE to be infused into schools, the author argued that this discipline should be implemented in teacher education programmes and should be performed through a cross-disciplinary approach, that is, across all of the subjects in the curriculum.

Finally, as a model descriptor, Alvarez and Vega (2004) noted, in connection with PsPTT, that “the profile of the EE teacher should contain the following features: a) the ability to adapt their subject or area of knowledge to the interpretation of real environmental facts; b) closeness to and respect for the environment, considering it in its entirety and integrating into it the whole gamut of human activities; c) the ability to make a realistic reading of the events which have an environmental impact and know-how to transform this into an educational project; d) the awareness of being a depository and producer of ethical codes with which to address environmental challenges” (p. 68).

Regarding this specific section, it is important to note that research points out the necessity of implementing training models that cover both environmental competencies of future teachers and also gives them a sufficient pedagogical background to transform these competences in teaching skills and capacity in their future role of teachers.

Evaluation of the Integration of EE/ESD into the Curriculums of University Teacher Training Courses

Two studies were found that analysed the integration of EE into the university curricula of primary PsPTT courses. A case study from the University of La Laguna, in the Canary Islands, analysed the importance given to EE in the curricula of primary, early childhood and pedagogy courses at this university and its presence in educational projects of the individual teaching subjects. The analysis showed that EE as a subject was present in only one specialty; otherwise, it was treated as content in different subjects. The ecological concept prevailed, and it was noted that there was little presence of EE in educational projects (Suárez & Teixé, 2007). A later study (Sureda, Oliver, Catalan, & Comas, 2014) carried out an in-depth analysis of the situation in different Spanish universities after the process of convergence emerged from the European higher education area. These authors analysed the inclusion of environmental competencies in the primary teacher’s degree plans in 23 Spanish universities. The results highlighted the lack of specific training in EE in the curriculum of the degrees: only 26% of programmes included a specific EE subject, and it was always optional to students.

As a summary of this specific area of analysis, it is relevant to reflect that research carried out stresses the necessity of introducing EE subjects/modules in the curriculums of the prospective teachers’ courses.
Discussion and Conclusions

The documents retrieved from the literature search conducted allowed us to deepen our understanding of some formal aspects and to make a summary of the research conducted to date. However, we are aware that the results of this review are limited by the documentary sources consulted and the type of resources analysed, as it must be remembered that only articles published in peer-reviewed academic journals and doctoral theses were considered. There are undoubtedly documents of interest on this topic that were not included in the academic databases consulted and therefore have not been considered to provide a thoroughly comprehensive overview of the state of the art of EE education in PsPTT.

According to the research content, the frequency of terms used leads us to posit that while EE is one of the most frequently used terms (899), ESD (282) also has importance in the environmental training of teachers, probably due, amongst other factors, to the implementation of the Decade of Education for Sustainable Development (DESD) in 2005.

In light of the content analysis performed, we have seen the topic of EE present in discussions about teacher training since the 1970s. Although in the early years, the issues were mainly theoretical in nature, with proposals for promoting this type of training, in recent years there has been an attempt to empirically show the current state of affairs for students studying these degrees. The outcomes of this research have highlighted the low level of teacher training in EE, either because of their low environmental knowledge (Boon, 2010; Puk & Stibbards, 2010; Tal, 2010) or their poor environmental literacy (Goldman, Yavetz, & Pe’er, 2006; Tuncer, Boone, Tuzun & Oztekin, 2014). Much of the research that empirically evaluated this training agreed on the need to include EE in the curricula of PsPTT. In the case of Spain, according to the latest research, it appears that the curricula are oriented in this direction (Sureda-Negre, Oliver-Trobat, Catalan-Fernández, & Comas-Forgas, 2014).

In summary, the studies analysed point to the undeniable role of teachers in the infusion of EE into schools as a tool to environmentally educate future citizens. However, for this education to be effective in schools, adequate training of pre-service teachers is needed so that those professionals gaining these qualifications can achieve the competencies of an environmentally educated person and the professional competencies of an environmental educator (Alvarez & Vega, 2004). Regarding the first group of competencies, the various studies that have evaluated the training of teachers in EE have shown somewhat disappointing results. As to the second group of competencies, the models proposed in the 1980s should be revised. Additionally, those experiences that have proven to be effective in improving the training of future teachers should be analysed with a view to refocusing the curricula of PsPTT qualifications towards the acquisition of these competencies.

Recommendations

Based on the literature meta-analysis carried out regarding EE in PsPTT, we feel it is necessary to:

- implement a profound review of how environmental competences are instructed amongst future teachers at the universities and how environmentally competent
prospective teachers are when they finish their training before starting their professional career;

- establish clear minimum criteria (basically, competences, contents and teaching methodologies and didactics of EE) in the curricular design of the PsPTT, which will warrant basic preparation in EE for future primary teachers and, consequently, impact their future pupils;
- improve the relevance of the concepts and competences related to EE in the PsPTT curriculums, without falling into what Elliot expressed (1998, cited by Wong Bing Kwan & Stimpson, 2003) as “politically symbolic acts which publicly signify concern for the environment, rather than with the construction of effective and educationally worthwhile pedagogic practices for EE” (p. 174);
- analyse and focus on which pedagogic/didactic methodologies best improve the environmental competences amongst prospective teachers during their pre-service training period at the universities and training centres;
- promote learning experiences among PsPTT students based on practical and experiential activities;
- implement specific compulsory modules on EE and ESD to prospective teachers during their pre-service training.

References


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Communication Skills Training in Trainee Primary School Teachers in Spain

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Abstract
Research on teacher training often focuses on learners’ perceptions of that training. The focus of this paper, which uses a research-to-practice approach, is instead on the views of the trainers. It evaluates the perceptions of university lecturers teaching classes as part of primary teachers’ training degrees and assesses their views of the communication skills developed by their students to be used in their future careers. The study uses a 17-item ad-hoc questionnaire, completed by 152 lecturers from the University of Granada. Descriptive and inferential analyses are then carried out on the data collected using SPSS. The analysis results show how important lecturers believe it is for trainee teachers to develop communication skills, which they often lack. Although lecturers believe communication skills are very important, they also think that they are not developed as much as they should be in their classes, so trainee teachers cannot communicate as effectively as they should.

Keywords: classroom communication skills, communication in teaching, developing communication skills, education communication, primary teacher training

Communication is an interpretative process through which agents interact, responding and creating messages sent via a conduit using a specific code. Each communicative act is unique and is an unrepeatable combination of specific individuals, intentions, places, moments and circumstances. When this act takes place in schools and classrooms, it is known, in the Spanish-language literature at least, as educational communication, communicative pedagogy (Kaplún, 2004), educommunication (Sánchez Cerezo, 1991) or pedagogical communication skills (Cruzata & Salazar, 2012). The interaction is usually between teachers and students, and its aim is primarily educational, although communication also takes place between teachers and institutions, between two or more teachers, and so on.

The quality of teaching depends, in part, on the quality of communication in the classroom, so researchers have recently become interested in how to ensure that communication is as effective as it can be. Of all the skills that a teacher must have, communication skills are particularly important. Although interest in the topic is relatively recent, the importance of communication has led to numerous studies on teachers’ communica-

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communication skills which can be used to help guide the initial teacher training process (Bolívar & Domingo, 2004; Barrón, 1989; Camacho & Sáenz, 2000; Camacho, Martínez, & Mendiás, 1999; Cascante, 2004; Perrenoud, 2007; Castellá, Comelles, Cross, & Vilà, 2007). In all of these studies, communication skills are seen as an essential part of the teacher’s professional repertoire. Some studies have found that teachers have problems communicating, either because they are unaware of the keys to effective communication or because of other factors associated with their own personalities or methods of communicating. The receiving and understanding of messages can also be disrupted by the behaviour of the speaker and listener as well as by external factors.

Although the importance of communication is widely acknowledged and shortcomings have been detected in this area most teachers do not receive specific training on classroom communication. It is only recently that innovative new techniques have started to be incorporated into continuing teacher training programmes. This appears to be true of most countries (Kaplún, 2004), which are interested for incorporating the communicational competences into the teaching training in the current society of the knowledge, known as the society of the information and communication. Obviously, the value of this research is limited from the geographical context in which the study was done, although it may serve as an example and encourage research studies in other contexts. It is also surprising that although there are plenty of theoretical studies on what communication skills consist of and how they can be developed. There are few empirical studies on the real need for them for practising teachers, as part of their continuing education or professional development. There are even fewer studies on communication skills during initial teacher training.

The development of communication skills in primary teacher training is exceedingly important (National Agency for Quality Assessment [ANECA], 2004), so this paper focuses on that area. The overall aim is to assess how well-developed trainee teachers’ communication skills are and how university lecturers try to develop those skills in their students. More specifically, the aim is to evaluate lecturers’ perceptions of the communication skills of their students – future primary school teachers – and to what degree the different communication sub-skills (communicating academic and pedagogical content, listening, communicating in the classroom, attending meetings and acting as a tutor) are developed throughout the degree.

The objectives of this study are therefore to:

- find out how important university lecturers feel it is to develop communication skills in trainee primary teachers;
- find out how much work lecturers do during their classes to help to develop communication skills in their students (primary teachers in training);
- assess the communication skills of trainee primary teachers based on the perception of their lecturers;
- evaluate the relationships between the three previous variables in order to detect any shortcomings in trainee teachers’ acquisition of communication skills.
Method

This descriptive study uses a quantitative research method. This approach was selected because it was deemed to be the most appropriate for the hypothesis and objectives previously stated as it provides an overview of the approach to teaching communication skills in trainee primary teachers’ and lecturers’ perceptions of those skills. The complexity of the quantitative approach can vary, ranging from simple reports of frequency (descriptive studies) to studies that analyse relationships or links (analyses of correlations or contingencies). This study uses both methods, making use of all of the analytical methods available to interpret the phenomenon studied.

Given the objectives and focus of this paper, the survey research (McMillan & Schumacher, 2005) approach was selected for use here because of its versatility, efficiency, generality, suitability, reliability, comparison and applicability (Cohen & Manion, 2002; Schutt, 2001). A cross-sectional design was chosen, as it is the most suitable and frequent approach used in survey research.

The specific data collection technique used was the questionnaire, a frequently used approach (Cea, 2002) as this method makes it possible to obtain information from the research population about the variables studied in a systematic and organised way (McMillan & Schumacher 2005). It was essential for the questionnaire to include specific questions about the research objectives so that those objectives could be met using information about the real situation of the research population. Questionnaire surveys gather data at a particular moment with the aim of describing existing conditions, identifying norms/patterns with which to compare these existing conditions and determining relationships between specific events (Cohen & Manion, 2002).

A review was carried out incorporating a number of standardised questionnaires used in other analyses, and an ad hoc questionnaire was selected. This questionnaire was validated using the panel of experts and triangulation method (Fox, 1987). It is a 17-item multiple choice questionnaire using a 5-point Likert scale (1 = not at all/never; 2 = a little/not enough; 3 = somewhat/enough; 4 = quite a lot/a lot; 5 = always/very much). The questionnaire included questions on each of the different sub-skills of communication skills. Respondents were asked if they worked on each sub-skill in their classes or not, if they believed that they should have and to what extent they believed their students achieved that sub-skill. Each sub-skill was allocated one section of the questionnaire, resulting in a total of five sections, one for each of the five communication sub-skills that future teachers must have as a speaker, a listener, a teacher, a meeting attendee and a tutor (Camacho & Sáenz, 2000; Camacho et al., 1999; Sanz, 2005).

The study group was made up of lecturers in the primary teacher training course at the University of Granada (Spain). Tagliacarne’s equation (1968) was used to calculate the sample group size required for reliable statistically significant findings in finite populations. The sample used was large enough to be statistically significant as it consisted of more than half of the reference population, a total of 152 teachers.

Once the data had been collected, they were analysed using quantitative techniques suited to the demands of the statistical model and research objectives, using different statistical and descriptive approaches. The data were analysed using SPSS 14.0. Two types of analysis were carried out: a descriptive analysis and a contingency analysis.
• The descriptive analysis, quantifying tendencies, was carried to calculate for each variable in order to estimate its distribution, with the aim of providing an overview of the sample group based on the distribution of the variables studied. Central tendency was measured using means, medians and modes. The variance and the standard deviation were calculated to provide data about frequency distribution. Partial, cumulative and total percentages were calculated for each sub-aspect or dependent variable. Frequencies were also calculated.

• The contingency analysis was used to summarise the relationships between the categorical variables (Sánchez Carrión, 1989). In this case, the general importance of communication skills for teachers and the three aspects were assessed: need to work on communication skills during primary teacher training courses; work done on this area in each subject and/or by each lecturer and progress made by students. Chi-squared distribution was used to determine if the relationships between these variables were statistically significant. Values lower than 0.001 were deemed statistically significant.

Results

When asked about the general importance of communication skills for teaching, 91.2% of the lecturers surveyed replied that they are very important (score 5 on the Likert scale, see Table 1). None of the lecturers answered that communication skills were not at all important (1 on the scale). As the frequencies and cumulative percentages in Table 1 show (the cumulative percentages for answers 2, 3 and 4 on the scale amount to less than 8%), none of the other answers on the 5-point scale were representative or significant.

Table 1
Importance of Communication Skills in Teaching

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>% valid</th>
<th>% accumulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Val 2.00</td>
<td>2</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Val 3.00</td>
<td>2</td>
<td>1.3%</td>
<td>1.3%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Val 4.00</td>
<td>8</td>
<td>5.3%</td>
<td>5.3%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Val 5.00</td>
<td>140</td>
<td>91.2%</td>
<td>91.2%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>152</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

The following sections outline the descriptive data along with the contingencies for each of the three aspects studied. The significant contingencies were analysed by cross-tabulating the lecturers’ responses in order to provide a more comprehensive overview of their views about communication skills. The most significant findings resulted from cross-tabulating their responses about the importance of communication skills with their responses, by sub-skills, on whether that sub-skill should be worked on, whether it is worked on in class and the lecturers’ perceived level of acquisition of that sub-skill by students, for the five sections of the questionnaire (a speaker, a listener, a teacher, a meeting attendee, a tutor).
Lecturers’ Views on the Need to Work on Communication Skills

It is clear that most of the lecturers believe that it is very important to include work on communication skills in primary teacher training (Table 2). The highest frequencies are for value 5 on the 5-point scale, with an overall mean of more than 70%. The means for each communication sub-skill are all higher than the overall mean, with the exception of the need for skills for taking part in meetings, which scored a little over 60% with a weighted average of 4.5 (still statistically significant) and a slightly lower variance and a standard deviation than the other types of communication. The overall weighted mean for this question is 4.6. The mode and median for all items is 5.

Table 2
Need to Work on Communication Skills in Primary Teacher Training Courses

<table>
<thead>
<tr>
<th>Value/role</th>
<th>Nothing (1)</th>
<th>Little (2)</th>
<th>Normal (3)</th>
<th>Quite (4)</th>
<th>Always (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Speaker</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2.6</td>
<td>31</td>
</tr>
<tr>
<td>Listener</td>
<td>0</td>
<td>4</td>
<td>2.6</td>
<td>4</td>
<td>2.6</td>
</tr>
<tr>
<td>Teacher</td>
<td>0</td>
<td>2</td>
<td>1.3</td>
<td>12</td>
<td>7.9</td>
</tr>
<tr>
<td>Attender</td>
<td>0</td>
<td>10</td>
<td>6.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tutor</td>
<td>0</td>
<td>4</td>
<td>2.6</td>
<td>2</td>
<td>1.3</td>
</tr>
<tr>
<td>Mean</td>
<td>0</td>
<td>4</td>
<td>2.6</td>
<td>4.4</td>
<td>2.9</td>
</tr>
</tbody>
</table>

A contingency analysis (Table 3) was carried out, grouping the percentages into 2 categories (high and low importance of communication skills), revealing that the lecturers are quite aware of the need to work on communication skills: 95.2% consider it to be important, and just a small minority group (4.8%) believe that it is not necessary to do any significant work on these skills.

Table 3
Variable Cross Tabulation: Need to Work on Communication Skills and Importance of Communication

<table>
<thead>
<tr>
<th>Need to work Importance</th>
<th>Work studies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 % within ( V_2 )</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>% of total</td>
<td>4.8%</td>
<td>19.3%</td>
</tr>
<tr>
<td>3 % within ( V_2 )</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>% of total</td>
<td>0%</td>
<td>23.3%</td>
</tr>
<tr>
<td>4 % within ( V_2 )</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>% of total</td>
<td>0%</td>
<td>52.4%</td>
</tr>
<tr>
<td>Total</td>
<td>4.8%</td>
<td>95.2%</td>
</tr>
</tbody>
</table>

Examining the relationship between this and how important the lecturers feel communication skills are, it becomes apparent that only respondents in the second group
(those who believe that the skills do not need to be worked on in class) believe that the skills are not very important. As a result, around 20% responded that the skills should only be worked on a little or not much. However, 19.3% of the same group, like the vast majority of their colleagues, believe that considerable work should be done on communication skills.

Lecturers’ Work on Communication Skills during Classes

The lecturers believe that training on communication skills for teaching is satisfactory (3 on the Likert scale) in the classes that they teach. In fact, the overall score for the different sub-skills of communication is 3, with similar scores for the responses on either side of the middle (1 and 5/2 and 4), as Table 4 shows. The overall mode and median for the different sub-skills are also both 3, with means around the same value. However, the remaining scores are not quite as equidistant from the middle score in this case as the mean scores for the first 3 sub-skills in Table 4 (speaker, listener and teacher) are higher than 3 (3.1, 3.2 and 3.2 respectively). In other words, the frequencies of scores 4 and 5 are considerably higher than those for 1 and 2 respectively. However, for the final two skills, the opposite happens: the means are lower than the middle value of 3 (2.9 and 2.7 respectively), and the frequencies of scores 1 and 2 are much higher than those for 4 and 5 respectively. Furthermore, the means are not the only noteworthy results. As Table 4 shows, the variance (1.2) and standard deviation (1.1) of the final sub-skill (a tutor) are quite different from the overall variance and standard deviation (0.8 and 0.9 respectively). This indicates a greater data spread.

Table 4
Amount of Work on Communication Skills by Lecturers

<table>
<thead>
<tr>
<th>Value/role</th>
<th>Nothing (1)</th>
<th>Little (2)</th>
<th>Normal (3)</th>
<th>Quite (4)</th>
<th>Always (5)</th>
<th>Mode</th>
<th>Mean</th>
<th>Median</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker</td>
<td>0 0 40 26.3</td>
<td>66 4.3 42 27.6</td>
<td>4 2.6</td>
<td>3 3.1</td>
<td>3 0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listener</td>
<td>0 0 26 17.1</td>
<td>76 50 42 27.6</td>
<td>8 5.3</td>
<td>3 3.2</td>
<td>3 0.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>2 1.3 36 23.7</td>
<td>68 44.7 34 22.4</td>
<td>12 7.9</td>
<td>3 3.1</td>
<td>3 0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attender</td>
<td>10 6.6 38 25</td>
<td>66 43.4 34 22.4</td>
<td>4 2.6</td>
<td>3 2.9</td>
<td>3 0.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tutor</td>
<td>22 14.5 44 28.9</td>
<td>50 32.9 28 18.4</td>
<td>8 5.3</td>
<td>3 2.7</td>
<td>3 1.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>8.8 5.7 36.8 23.9</td>
<td>65.2 42.3 36 23.4</td>
<td>7.2 4.7</td>
<td>3 3</td>
<td>3 0.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to the contingency analysis (Table 5), 53.3% of the lecturers believe that they work on these skills enough, 40% of the respondents – work on them little or not enough and 6.7% of the respondents say that they do not work on them at all. 16.7% of the respondents believe that working on the skills is unimportant, 16.7% of the respondents believe that it is quite important and 66.7% of the respondents say that it is important. None of the other responses on the scale were used.
Looking at this another way, 93.3% of the lecturers say that they work on communication skills between a little and enough, but they are the same lecturers who believe the skills are more important. Those who believe working on the skills is less important are obviously more likely to answer that they do not work on those skills at all. The data are therefore very similar to the descriptive data in the previous table.

Table 5
Variable Cross Tabulation: Work on Communication Skills in Classes and Importance of Communication

<table>
<thead>
<tr>
<th>Classroom work Importance</th>
<th>Classroom work</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% within $V_2$</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>% of total</td>
<td>20%</td>
<td>20.0%</td>
</tr>
<tr>
<td></td>
<td>3.3%</td>
<td>3.3%</td>
</tr>
<tr>
<td>3 % within $V_2$</td>
<td>0%</td>
<td>40%</td>
</tr>
<tr>
<td>% of total</td>
<td>0%</td>
<td>6.7%</td>
</tr>
<tr>
<td>4 % within $V_2$</td>
<td>5%</td>
<td>45%</td>
</tr>
<tr>
<td>% of total</td>
<td>3.3%</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>6.7%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Lecturers’ Perception of Students’ Acquisition of Communication Skills

The lecturers surveyed believe that primary teachers in training do not acquire communication skills satisfactorily. The overall mean response is 2.6 and the mode and median – 2. These findings confirm the higher frequency and percentage (50.9%) of response 2 on the Likert scale for questions relating to the acquisition of the different communication sub-skills. 3 different sub-groups of skills can be discerned based on the descriptive data calculations. Firstly, the skills that lecturers believe are acquired the least are those as a meeting attendee and a tutor, with a mean of 2.4 in both cases and a mode and median of 2, the same as the overall mode and median. The tutor’s sub-skill has the greatest data spread (variance=0.7), although the difference is very small. In the middle are skills as a speaker, with results exactly the same as the overall scores: a mean of 2.6 and a mode and median of 2. Even the variance and standard deviation are the same as the overall results. Finally, the scores for skills as a listener and communicator in the classroom are higher than the overall average, with means of 2.9 and 2.6 respectively and modes and medians of 3, again higher than the overall mode and median. The difference in this sub-group is in the way in which the data are grouped together, as there is a greater data spread for the first sub-skill (variance = 0.9) than for the second one (variance=0.4).
Table 6
Students’ Degree of Acquisition of Communication Skills

<table>
<thead>
<tr>
<th>Value/role</th>
<th>Nothing (1)</th>
<th>Little (2)</th>
<th>Normal (3)</th>
<th>Quite (4)</th>
<th>Always (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n %</td>
<td>n %</td>
<td>n %</td>
<td>n %</td>
<td>n %</td>
</tr>
<tr>
<td>Speaker</td>
<td>10 6.6 72 47.4</td>
<td>50 32.9 14 9.2 6 3.9 2</td>
<td>2.6 2 0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listener</td>
<td>6 3.9 48 31.6</td>
<td>64 42.1 24 15.8 10 6.6 3</td>
<td>2.9 3 0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>8 5.3 58 38.2</td>
<td>74 48.7 4 2.6 8 5.3 3</td>
<td>2.7 3 0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attender</td>
<td>16 10.5 76 50</td>
<td>52 34.2 4 2.6 4 2.6 2</td>
<td>2.4 2 0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tutor</td>
<td>22 14.5 64 42.1</td>
<td>50 32.9 16 10.5 0 0 2</td>
<td>2.4 2 0.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>12.4 8.2 63.6 50.9</td>
<td>58 38.2 12.4 8.2 5.6 3.7 2</td>
<td>2.6 2 0.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The cross-tabulation that seems to be most significant is between lecturers’ views of the importance of communication skills for trainee primary and pre-primary teachers and their perceived level of acquisition of those skills by the students. Table 7 shows that there is a greater range in the perceived level of acquisition, with 4 different responses (ranging from none to quite a lot) while the perceived importance obviously still ranges between not very and quite. 66.7% of the lecturers say that their students do not acquire communication skills satisfactorily while 20% believe that their acquisition is satisfactory or good.

As Table 7 shows, there are no significant differences between the lecturers who gave the importance of communication skills a score of 2, 3 or 4. However, there is a significant difference between the lecturers who gave it the lowest score and those who gave it the highest one as the former feel that their students do not acquire the skills at all 13.3% of the respondents while the latter believe that 3.3% of the respondents become highly skilled (Table 7).

Table 7
Variable Cross Tabulation: Acquisition of Communication Skills and Importance of Communication

<table>
<thead>
<tr>
<th>Acquisition Importance</th>
<th>Level of achievement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 % within V2</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>% of total</td>
<td>3.3%</td>
<td>10%</td>
</tr>
<tr>
<td>3 % within V2</td>
<td>0%</td>
<td>80%</td>
</tr>
<tr>
<td>% of total</td>
<td>0%</td>
<td>13,3%</td>
</tr>
<tr>
<td>4 % within V2</td>
<td>15%</td>
<td>65%</td>
</tr>
<tr>
<td>% of total</td>
<td>10,3%</td>
<td>43,3%</td>
</tr>
</tbody>
</table>

Discussion

Table 8 provides a summary of the conclusions outlined above and reflects the need to tackle the mostly poor results by designing training activities aimed at both students and lecturers on the teacher training course.
Table 8

Summary of Findings on Communication Skills Assessed

<table>
<thead>
<tr>
<th>Variable dimension</th>
<th>1. Need to work</th>
<th>2. Classroom work</th>
<th>3. Level of achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mode/median</td>
<td>Mean</td>
<td>Variance</td>
</tr>
<tr>
<td>Speaker</td>
<td>5</td>
<td>4.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Listener</td>
<td>5</td>
<td>4.6</td>
<td>0.5</td>
</tr>
<tr>
<td>Teacher</td>
<td>5</td>
<td>4.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Meeting attendee</td>
<td>5</td>
<td>4.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Tutor</td>
<td>5</td>
<td>4.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Mean</td>
<td>5</td>
<td>4.65</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Based on the perceptions of lecturers, this study has determined the degree of acquisition of communication skills worked on in class by trainee primary teachers and how important this type of training should be.

Almost all of the lecturers surveyed believe that communication skills are an essential part of the initial training of primary teachers. Their responses to the survey’s first question about the importance of these skills show that they believe that communication skills are of the utmost importance in primary teacher training. The lecturers almost unanimously give the highest scores for the importance of each of the different communication sub-skills. These findings are consistent with those of other studies which confirm the importance of skills training in higher education (Elmore, 2003; García San Pedro, 2007; Irigoyen, Jiménez, & Acuña, 2011; Moreno, 2009; Valladares, 2011), specifically in primary teacher training courses (Abbott & Huddleston, 2000; ANECA, 2004, 2006; Cruzata & Salazar, 2012; European Commission/EACEA (Education, Audiovisual and Culture Executive Agency)/Eurydice, 2012; Fullan, 2007; Ortiz, 2005; Perrenoud, 2007; Rubio, 2009; Sanz, 2005; Tejada, 2009).

Overall, the lecturers surveyed believe that communication skills are worked on sufficiently. They tend to admit that more emphasis is placed on developing skills as a speaker (middle to high score) than on developing communication skills as a tutor (middle to low score). According to the studies reviewed, working on communication skills during initial teacher training is not just useful but necessary (Núñez & Del Moral, 2010). However, as this study shows, systematic training is not guaranteed and much of it is left to improvisation, defined by (Huguette & Pourtois, 2006) as implicit training.

Despite this, the lecturers surveyed believe that the communication skills acquired by student teachers are unsatisfactory. This is especially true of the sub-skills for taking part in meetings, followed by sub-skills as a speaker and a tutor (low to middle score). Only skills as a listener and communicator in the classroom were given scores closer to 3 on the Likert scale. Although there are no studies that focus specifically on this point, there are a number of general studies that reveal the lack of connection between what students learn in their initial training and the skills they need in their professional lives, as a failing in advanced training (Fernández, 2009). Furthermore, a complementary study has found that even the trainee teachers themselves believe that they do not have the communication skills they need for their future professional lives (Domingo, Gallego, García, & Rodríguez, 2010).

The contingency analyses reveal a significant drop in the scores assigned to the two previous points (from 3 to 2). In other words, while 53.3% of the respondents believe
that communication skills are worked on sufficiently, 80% believe that these skills are not acquired. This finding needs to be analysed carefully, especially given that 95.2% of the lecturers surveyed believe that communication skills are important for teachers. Table 8 shows that, although working on communication skills is deemed essential for primary teacher training, it is done only satisfactorily in each of the subjects taught. In fact, the students do not learn the skills as well as they should. This suggests that there should be more explicit work on communication skills in all of the classes taken by trainee teachers and that lecturers should be more concerned about developing their students’ ability to communicate.

It is not enough to highlight the need to develop students’ communication skills, given the lecturers’ lack of satisfaction with the way in which they are worked on in the classroom and their perception that students do not acquire these skills satisfactorily. It may be necessary to provide training to lecturers on primary teacher training courses, teaching them the techniques and strategies required to develop their students’ communication skills. These techniques could then be incorporated into their syllabuses and teaching plans (Cascante, 2004), as per the recommendations of the studies reviewed here, and tried and tested in the teaching practice of the degree, as per other studies. There are some suggested training techniques in the bibliography (Ortiz, 2005; García San Pedro, 2007; Calzada, 2007; Rodríguez Ruiz, 2011), for different geographical contexts, due to the concern about the communicational competency development of the teachers of various educational levels, as emphasised above. New training activities could be designed basing on the shortcomings detected in this study.

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How Children can Support Their Learning to Write and Read by Computer in the Early Years of School

Marja Nurmilaakso
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Abstract

Over the last decades the nature and form of what children can choose to read has changed radically, partly as a consequence of rapid technological advances and the increasing dominance of the image. The research questions were: 1) How do children learn to read and write by computer? 2) How can one support children’s learning during the transition from pre-school to primary school? and 3) How can we support learning during the transition from pre-school to primary school in the future? This work is based on a questionnaire that was sent to kindergarten and primary school teachers in the Helsinki area. Only 27 teachers in the pre-school or primary school answered the questionnaire. Following this, the questionnaire was also sent to kindergarten and primary school student teachers. The results show that it is easy for children to acquaint themselves with the computer keyboard and that children actually enjoy playing by writing on computer. The respondents said that children must, at first, train to write by hand, then by computer.

Keywords: computer, pre-school, primary school, writing, reading

The current generation of young learners is literally the first of the Information Age. These children are developing in a world infused with the media and digital materials—a world where distinctions between television, computers, films and books are fast becoming blurred, where all experiences are multi-rather than mono-media (Wild, 2000).

Over the last few decades the nature and form of what children can choose to read has changed radically, partly as a consequence of rapid technological advances and the increasing dominance of the image. The multimodal texts now readily available commonly include sound and music, voices, intonation, stance, gesture and movement, as well as print and image, and exist in different media such as computer screen, film, radio and book (Cremin, 2007). These multi-modal texts have changed the ways in which meaning is constructed. Over recent years, there has been increasing attention to the importance of accessing and responding to children’s perspectives on issues and events that are relevant for them. This trend has been influenced by several agendas, for example,
the United Nations Convention on the Rights of the Child, which recognises children’s rights to be consulted and heard on matters that affect them. Underpinning these approaches to listening to children’s voices has been the philosophy that children are valued as people, as citizens, right now, as well as for the contributions they may make in the future. In this way, early childhood is not regarded as merely a preparation for later adolescence and adulthood. Children are skillful communicators who utilise a range of strategies to share their expertise. They are active agents, who influence the world around them, as well as being influenced by it (Dockett & Perry 2012). Instead, teachers’ attitudes to computers and media are sceptical. Tella (2003) acknowledges that teachers’ resistance to multimedia, such as computers and mobile phones, in education is worrisome because teachers, at all levels, are key in shaping the knowledge society. Possible reasons for teachers’ low motivation to use technology in their teaching could stem from a fear of seemingly obscure and dauntingly complex concepts such as e-learning, which, according to Tella (2003), is a kind of cliché. Karevaara and Thuss (2002) also stress that few teachers really understand what “technologies” mean. Chen and Chang (2006) are of the same opinion. Although computer technology has been recognised for its great potential to enhance teaching and learning, the results of various studies indicate that many early childhood teachers are not ready to integrate computers into the classroom.

Stephen, Ellis and Martlew (2010) studied active learning pedagogical practices that are familiar in pre-school settings in the 1st form of primary school. According to them, no one task or form of interaction could be identified as more engaging than another for children. The more open-ended activities where children interacted with peers at small world play, shared books, searched together for letters to build words, explored number bonds produced periods albeit with distractions, of involvement and some examples of intense and sustained engagement. On the other hand, some children were observed to be engaged (sometimes intensely engaged) when painting or drawing, copying words, writing “number stories”, engaging in the construction or involved in imaginative play on their own. Vygotsky (1994) wrote imitation and instruction play major roles in a child’s development. They bring out the specially human qualities of the mind and lead children to new developmental levels. In learning to speak, as in learning school subjects, imitation is indispensable. What children can do through cooperation today, they can do alone tomorrow.

Learning to Read and Write by Writing on Computer

How Children Learn to Read and Write

According to the Core Curriculum for Pre-school Education in Finland (2010), children should be told fairy tales, stories, narrative factual texts, poems, etc., so as to provide a chance for them to enjoy what they hear. Children will live with what they hear, they will obtain material for their thinking, and their ability to understand their own and other peoples’ lives will strengthen. They will start to understand the significance of reading. They will become interested in asking questions, drawing conclusions and evaluating what they have heard. The objective shall be to inspire children’s interest in observing and exploring the spoken and written language. The targets of exploration may include various texts, expressions, individual words, letters and sounds in a context that is meaningful for children. The development of linguistic awareness shall be
supported through playing with language, talking nonsense, rhyming as well as through exploring the written forms of language diversely. Children will gain experience of how to convert speech into written language and writing into spoken language both through examples see by adults and through their own attempts to read and write.

In studies that were made about fifteen years ago, some staff had reservations that the presence of a computer would create a situation in which competition to use the computer might cause conflict among the children. Other staff thought that some children might be excluded because of a lack of skills or that some children would want to spend their time exclusively engaged in computer-based activities. After a great deal of discussion and reflection, the decision was made to purchase a computer as well as a table specially designed to accommodate the size of the children so that access would be as easy as possible. After two months, the staff were convinced that they had made right decision (Wild 2000).

Wild (2000) claims that a computer programming language specially created for children of pre-school and primary age would radically change the ways in which young children learn in schools. Computers can provide a context for learning in which socialisation would be based on the potential of the individual, an empowering sense of one’s own ability to learn anything one wants to know, conditioned by deep understanding of how these abilities are amplified by belonging to cultures and communities. Digital storytelling facilitated professional dialogue in several ways (Savvidou, 2010). Firstly, it allowed for asynchronous communication, so that stories were exchanged without constraints of time or place. Stories were responded to within several days or weeks and were recorded in lecturer’s offices or homes later to be uploaded onto the departmental website. Moreover, the flexibility of digital storytelling created the potential for participants to be both consumers and tellers of stories.

According to Burnett (2010), whilst studies of reading explore literacy learning as a process of interaction between the child and the computer as a surrogate teacher, studies of writing use the computer as a stimulus for children’s composition. In both sets however, the focus is on literacy as an individual endeavour with multimedia elements designed to meet objectives associated with the existing print literacy curriculum. Technology’s position is as a delivery of literacy (Burnett 2010).

The Norwegian pedagogue Arne Trageton (2007), in his project “Playful Computer Writing” studied six-year-old children in classes in different parts of Norway, three in Denmark, one in Finland and one in Estonia. The project started in 1999. Trageton followed these children for three years. Students had in their classrooms some computers, where only word processing was possible. The schools got old computers from firms, from the community and from parents. All writings were created in printed letters. Formal handwriting, usually taught in the 2nd form in Norway, was delayed to the 3rd form. Trageton’s assumption was that the children then would learn formal correct handwriting much faster than in the 2nd form. According to Trageton, it saves time for more important areas in language education.

**How a Teacher can Support a Beginning Reader or Writer**

According to Vygotsky’s (1978), what a child can do in cooperation today he/she can do alone tomorrow. Therefore, the only good instruction is that which marches ahead of development and leads it.
Bronfenbrenner (1970) talked about a broadened conception of the teacher’s role. Not only must he/she herself function as a motivating model, but it becomes his/her responsibility to seek out, organise, develop and coordinate the activities of other appropriate models and reinforcing agents both within the classroom and outside. The total school should be actively involved in furthering the development of the older child and, subsequently, younger children in the process. For pre-school or primary school children, an older child, particularly of the same sex, can be a very influential figure, especially if he/she is willing to spend time with his/her younger companion. For example, in pre-school or primary school, pupils can have “a older brother or sister”. In this case, it becomes the responsibility of the older pupil to get to know his/her younger “sibling” and his/her family, to escort him/her to and from school, play with his/her friends, teach him/her games and, last but least, become acquainted with his/her progress and problems in school, reading with and him/her, helping and encouraging him/her to learn.

Children are naturally disposed to playing with words. An educator guides children’s observations, teaches them how to act in different situations, describes and explains events. Children are offered models for learning languages and concepts, and they are spoken to in such a way that they understand. For the child’s developmental environment to support the development of language skills, it should be stimulating and activating. The environment should allow the child to observe both spoken and written language.

It has been observed that children’s engagement in a activity rose when there was a supportive adult (not necessarily a teacher) alongside, but fell there was no help to remind the group about each stage of a task (Stephen, Ellis, & Martlew, 2010).

Purpose of the study

The Research Questions and Method

The research questions were: 1) How do children learn to read and write by computer? 2) How can one support learning during the transition from pre-school to primary school? and 3) How can we support learning during the transition from pre-school to primary school in the future?

The research method was an e-questionnaire. The questionnaire was sent to kindergarten teachers and primary school teachers in the area of Helsinki. 27 pre-school or primary school teachers answered the questionnaire. Also, 47 pre-school or primary school pre-service teachers answered the questionnaire. There were a total of 71 respondents in this study.

The research method used was an e-questionnaire. Firstly, there were background questions on, for example, age and education. Secondly, there were 19 questions relating to the first research problem about how children learn to read and write by computer. Thirdly, 43 questions related to the second problem in this study about how a teacher can support a child when he/she goes from pre-school to school. Lastly, 18 questions related to the third research problem about what may happen in the future.

This study used quantitative methods. The variables were measured on an ordinal (Likert) scale that offered five options. The data was analysed using SPSS (Tabachnick & Fidell, 2001), revealing frequencies and percent of interest. For each of three research problems there was an open question, providing qualitative data.
Results

How a Child Learns to Read and Write by Computer

Nearly all the teachers (n = 71) thought that it was easy for children to use the keyboard of a computer (fully agree or quite agree).

Table 1

<table>
<thead>
<tr>
<th>How a Child Learns to Read and Write by Writing on Computer</th>
<th>Disagree</th>
<th>Partly disagree</th>
<th>I can’t say</th>
<th>Partly agree</th>
<th>Fully agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) It is easy for children to acquaint themselves with the keyboard of a computer</td>
<td>4.2</td>
<td>9.9</td>
<td>69.0</td>
<td>16.9</td>
<td></td>
</tr>
<tr>
<td>(2) Writing on computer, children learn to see connections between the letters which they make and which they know</td>
<td>1.4</td>
<td>8.5</td>
<td>22.5</td>
<td>46.5</td>
<td>21.1</td>
</tr>
<tr>
<td>(3) Easiness to make letters stimulates children to try out more letters</td>
<td>4.2</td>
<td>5.6</td>
<td>43.7</td>
<td>46.5</td>
<td></td>
</tr>
<tr>
<td>(4) Children enjoy writing on computer</td>
<td></td>
<td>11.4</td>
<td>34.3</td>
<td>54.3</td>
<td></td>
</tr>
<tr>
<td>(5) Easiness to make signals stimulates children to find the correct letters little by little</td>
<td>2.8</td>
<td>21.1</td>
<td>49.3</td>
<td>28.8</td>
<td></td>
</tr>
<tr>
<td>(6) When children write on computer, they have a feeling that they can write</td>
<td>4.3</td>
<td>21.4</td>
<td>52.9</td>
<td>21.4</td>
<td></td>
</tr>
<tr>
<td>(7) Pre-school children should be able to use a computer every day</td>
<td>25.7</td>
<td>48.6</td>
<td>8.6</td>
<td>12.9</td>
<td>4.3</td>
</tr>
<tr>
<td>(8) In the early years of school, children must have a chance to work with a computer daily</td>
<td>11.3</td>
<td>42.3</td>
<td>12.7</td>
<td>23.9</td>
<td>9.9</td>
</tr>
</tbody>
</table>

All research questions included an open question. In this case the question was: What is the best and what is the worst when a little child learns to read and write by writing on computer? No less than 22 respondents said that it was very easy to correct mistakes. Some thought that it takes less time to write on computer (n = 10). Eight teachers thought that it was good for children to learn to use computers. Computers are today’s technology. Five respondents said that writing on a computer motivates children to write more, and that it is also fun to use computers.

At the same time, the respondents said that children’s handwriting suffers (n = 23). Six people were scared that children might become too dependent on computers. Some teachers thought that working with computers causes tiredness, headaches and other physical symptoms.

How a Teacher can Support a Child’s Learning during the Transition from Pre-School to Primary School

The respondents answered a question about how teachers can support learning during the transition from pre-school to primary school (Table 2)

As far as the open question is concerned, the respondents were asked whether it is essential or not that pre-school children learn to write by writing on computer. 36 in-service and pre-service teachers believed that was not necessary. No less than 14 out of 58 thought that a child should have time in primary school classes to learn to use com-
puters. Some respondents also said that a child of pre-school age was too little to use computers. 31 in-service and pre-service teachers said that computers were a part of present-day life. Many respondents were afraid that children’s handwriting would suffer. What if children fail to learn to write by hand?

Table 2

<table>
<thead>
<tr>
<th>How Teachers can Support Learning in the Transition from Pre-School to School</th>
<th>Disagree %</th>
<th>Partly disagree %</th>
<th>I can’t say %</th>
<th>Partly agree %</th>
<th>Fully agree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) When children are already used to writing by computer in pre-school, it is easy for them to go school, where learning by computer is a daily event</td>
<td>1.4</td>
<td>8.5</td>
<td>50.7</td>
<td>39.4</td>
<td></td>
</tr>
<tr>
<td>2) In pre-school, children can create by computer more demanding stories as they could make by hands</td>
<td>4.2</td>
<td>16.9</td>
<td>36.6</td>
<td>38.0</td>
<td>4.2</td>
</tr>
<tr>
<td>3) It is easy to expose children to language games on the Internet</td>
<td>1.4</td>
<td>5.6</td>
<td>43.7</td>
<td>49.3</td>
<td></td>
</tr>
<tr>
<td>4) When pre-school children learn to read by writing on computer, it helps in other areas concerning their mother language</td>
<td>5.6</td>
<td>38.0</td>
<td>42.3</td>
<td>14.1</td>
<td></td>
</tr>
<tr>
<td>5) In pre-school, children must learn to write by hand and only then – on computer</td>
<td>4.2</td>
<td>15.5</td>
<td>28.2</td>
<td>32.4</td>
<td>19.7</td>
</tr>
<tr>
<td>6) In pre-school, children can use and develop both their handwriting and computer writing</td>
<td>5.6</td>
<td>7.0</td>
<td>50.7</td>
<td>36.6</td>
<td></td>
</tr>
</tbody>
</table>

The third problem in the study was how to support children’s learning during the transition from pre-school to primary school (Table 3).

Table 3

<table>
<thead>
<tr>
<th>How Teachers can Support Children’s Learning during the Transition from Pre-School to Primary School</th>
<th>Disagree</th>
<th>Partly disagree</th>
<th>I can’t say</th>
<th>Quite agree</th>
<th>Fully agree</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) There will be no need for books in pre-schools and schools in the future, and computers will take the place of books</td>
<td>57.7</td>
<td>28.2</td>
<td>8.5</td>
<td>4.2</td>
<td>1.4</td>
<td>71</td>
</tr>
<tr>
<td>2) Both books and laptops will be used in pre-schools and schools in the future</td>
<td>2.8</td>
<td>12.7</td>
<td>16.9</td>
<td>53.5</td>
<td>14.1</td>
<td>71</td>
</tr>
<tr>
<td>3) In the future, critical literacy will be important</td>
<td>1.4</td>
<td>19.7</td>
<td>36.6</td>
<td>42.3</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>4) It is also fun to learn to read and write by computer</td>
<td>21.4</td>
<td>52.9</td>
<td>25.7</td>
<td>71</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21 in-service teacher and 32 pre-service teachers stressed the importance of social and interaction skills (n = 53). Quite a few teachers were concerned that children’s handwriting would suffer (n = 12). The respondents said that, in the future, these would
be situations where we would not be able to write using a computer. Many people thought that computers were dangerous for children’s health. They might result in children’s addiction to computers.

The third the open question was: What is important to remember when computers are commonplaces in the future and children learn to write by computer? Once more the respondents said how important it is for children to be able to develop their handwriting skills. Also, many stressed the importance of communication between children, adults and teachers. Somebody noted that a child must still be a child. Computers shorten childhood.

Conclusions

About 80% of the teachers thought that it is easy for children to come across computers in the daily life. Children are born to a multimedia world. Whereas the teachers do not understand that children really enjoy writing. They imagine that they can write. And when children enjoy writing, then it becomes easier for them. If a child finds that writing is easy and sees that his/her knowledge of writing or writing skills is improving then this will also help the child to correct his/her own writing. When a child writes for a time, he or she is usually pleased with his/her work. In this way, learning becomes self-remedial. Teachers don’t need to correct mistakes.

Most respondents thought that the best way for children to learn is to write and practise both by hand and with a computer. Most respondents said that then it is easier for children to begin school that operates with computers. But, in Finland, it is very seldom that children, especially in pre-school, work with computers daily. If there is a computer in the class, it is usually in the corner of the room. Laptops are uncommon. We have games in Finland on the Internet that make it easy to support early literacy, and they are free of charge. Clearly, the respondents perceived games as entertainment, not as tools that support language learning. Following Whitehead (2011), several technologies for writing should be available: rubber pads, ink stamps, computers and printers with word-processing software and concept keyboards for the younger children. Information and communication technology can extend children’s knowledge of the alphabet and their awareness of marks of spacing and typefaces.

The respondents thought this was very out of date. Respondents answered that paper books aren’t missed. Computers cannot take the place of books. At the same time, the respondents thought that one of the most important tasks in the future will be to teach children to be critical learners that is the way one practises writing and reads what someone has written. We still need handwriting, but it is easier for many children to practise writing on computer. Exercises by something else as by pen is not a new matter. In 1968, Hainstock (1968), in her book on Montessori pedagogy, argues that it is important that a child has mastery of the pencil before learning letters, and she includes some set inset geometric exercises. This also enables the child to perfect his/her eye-hand coordination and control, without which good writing is not possible. When he/she becomes adept at working with these insets and has good pencil control, he/she is then able to begin actual letters and, soon after, words. Hainstock stresses Montessori’s famous idea: reading and writing go hand in hand. The child learns as his hand is written. Most children handle letters and become familiar with them before either reading and writing is possible.
In this study, many respondents thought that children in pre-school need learn to write and read. Nevertheless, Vygotsky (1978) said that, if younger children are capable of discovering the symbolic function of writing, as Hetzer’s experiments have shown, then the teaching of writing should begin in pre-school. Vygotsky also underlines that writing is neither a motor skill nor a complex cultural activity. Writing must be relevant to life. Moreover, according to Nurmilaakso (2009), we must always remember the culture in which we live when we speak of the future (see also Reunamo & Nurmilaakso, 2007). Pedagogical views are deeply rooted in the functions of our basic understanding of early childhood learning. These roles also call for a new interpretation of children’s use and learning of language. Language is not just a means for communicating or understanding; it also an important ingredient in cultural production. Learning and teaching are interwoven and they cannot be considered separately. In the future, the teacher’s task will be to understand the link between different types of learning and different pedagogies and to choose the most appropriate for any given situation.

References
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