

Proceedings of the
Irish Association for Social, Scientific
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June 20th and 21st, St Patrick's College (DCU), Dublin, Ireland

MEETING THE CHALLENGES
OF A GLOBALISED WORLD

Edited by Fionnuala Waldron

IASSEE

IRISH ASSOCIATION for SOCIAL, SCIENTIFIC & ENVIRONMENTAL EDUCATION



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Edited by Fionnuala Waldron with Elaine Davis

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Contents

<i>Introduction</i>	Fionnuala Waldron, Dean of Education, St. Patrick’s College.	2
<i>One</i>	<i>The world turned upside down.</i> by Stephen Scoffham. Canterbury Christ Church.	8
<i>Two</i>	<i>Integration Within a 21st Century School Curriculum: Purpose and Utility</i> by Frankie McKeon. University of Leicester.	13
<i>Three</i>	<i>Experiences of lessons from teaching Education for sustainable Development</i> by Rosalind Duke and Orla Kelly, Church of Ireland College of Education.	21
<i>Four</i>	<i>From research to resource: Critical Literacy and Global Citizen Education in Middle Primary School</i> by Rowan Oberman, Centre of Human Rights and Citizenship Education, St. Patrick’s College, Drumcondra.	29
<i>Five</i>	<i>Teaching Student teachers about development issues – Is it possible to avoid stereotype and prejudice,</i> by Richard Greenwood, Stranmillis University College, Belfast.	40
<i>Six</i>	<i>Sailing to Byzantium: “Byzantine Studies” as an exemplar of integrating science, history, geography and mathematics education</i> by Thomas McCloughlan, St. Patrick’s College, Drumcondra.	45
<i>Seven</i>	<i>From understanding towards responsibility: peace building education on the island of Ireland</i> by Benjamin Mallon, St. Patrick’s College, Drumcondra.	56
<i>Eight</i>	<i>The preliminary findings of the Science Coteaching in Teacher Education (SCITE Project): The student teachers’ perspective</i> by John McCullagh, Stranmillis University, Belfast, Colette Murphy, Trinity College & Andrea Doherty, Queens University, Belfast.	66
<i>Nine</i>	<i>Using digital teaching and learning tools with pre-service teachers for our modern primary science classrooms</i> by Maeve Liston, Faculty of Education, Mary Immaculate College, Limerick.	76
<i>Ten</i>	<i>MST curricula for 5,7,8,11 and 13 year olds research</i> by the SECURE Project, Job de Meyere, Dagmara Sokolowska, Elvira Folmer, Barbara Rovsek, Wim Peeters’ Thomas More, Vorselaar, Belgium Smoluchowski Institute of Physics, Jagiellonian University, Krakow, Poland Nationaal expertisecentrum leerplanontwikkeling SLO, Enschede, the Netherlands Faculty of Education, University of Ljubljana, Slovenia Dienst Katholiek Onderwijs vzw, Antwerpen, Belgium.	89
<i>Eleven</i>	<i>The SECURE project: analysis perceptions of teachers and learners on topic related to the IASSEE conference</i> by the SECURE Project.	107
<i>Twelve</i>	<i>Making development issues accessible for children through picture books</i> by Anne Dolan, Mary Immaculate College, Limerick.	127

INTRODUCTION

Fionnuala Waldron, St Patrick's College, Drumcondra

The 11th annual conference of the Irish Association for Social Scientific and Environmental Education (IASSEE) was held in St Patrick's College, Drumcondra, on 20 – 21 June, 2013. Founded in 2000, IASSEE represents a network of teacher educators on the island of Ireland who specialise in Geography, History and Science Education and related areas, such as Development and Human Rights Education. Since its foundation, the network has organised annual conferences, engaged in an all-Ireland longitudinal study of the experiences of primary student teachers in relation to history, geography and science education and commenced a follow-up study focused on the experiences of early-career teachers.

Entitled '*Meeting the Challenges of a Globalised World*', the 2013 conference brought together scholars and researchers engaged in teacher education across Europe to discuss a wide range of themes, including education for sustainable development; futures education; peace education; the impact of globalisation on the teaching of history, geography and science and reform practices in teacher education for the twenty-first century. This publication brings together a selection of papers from that conference, which address some of those key themes.

In the opening paper, Stephen Scoffham poses what is possibly the question of our time for educators and for policy-makers in a world increasingly characterised by rapid change and environmental challenges, how do we prepare children for an unknown future? Scoffham argues the importance of geography in empowering children to meet future challenges. Addressing the influence of perspective on how we see the world, he suggests that we need to go beyond the idea of information-gathering as a mode of exploring place with children to acknowledge the importance of the personal and the dynamic between place and identity. Scoffham concludes by arguing the necessity of exploring our multi-layered relationship with the natural world in ways that are holistic, ecological, and ethical, taking account of current and future obligations towards all the life forms that inhabit our planet.

The second paper in the collection focuses on the idea of subject integration as a response to the uncertain, fast-changing and complex nature of our globalised world where problem-solving, real-life application and connected learning are seen as essential characteristics of 21st century learning. Drawing on theorists of curriculum and integration, Frankie McKeon uses the frame of purpose, nature and utility (Tyler, 1949) to examine the potential offered by integration to meet the needs of learners. McKeon draws on a number of empirical studies to address teachers' attitudes towards integration, their needs in terms of the successful implementation of integrated approaches and the potential benefits in terms of teacher professional development. In conclusion, McKeon argues that while there is no conclusive evidence to support the effectiveness of integrated approaches for children's learning, a balance between integrated and disciplinary approaches could support children's capacities to engage with life in the 21st century.

Located in the context of the UN Decade of Education for Sustainable Development, the third paper in the collection addresses initial teacher education as a key site of learning. Rosalind Duke and Orla Kelly present two case studies, illustrating two alternative approaches to ESD in a teacher education context: a stand-alone unit delivered as part of a science module for ITE students specialising in science education and a non-assessed module in ESD offered to all students on an irregular basis. Both approaches had varying levels of success in relation to student engagement. As models for the integration of ESD into ITE, however, both were limited, consigning ESD to the margins of the process of teacher education. Duke and Kelly argue persuasively for the need to embed ESD systematically in initial teacher education, going beyond programmatic reform to include whole-college approaches, systemic critique and attitudinal change.

Paper 4 presents the findings of a research study into children's engagement with critical literacy and outlines how that research informed the development of a story-based resource for use in primary classrooms. In presenting the theoretical framework that underpinned the research, Rowan Oberman draws on a wide range of literature to interrogate the relationship between critical literacy and global citizenship education, highlighting their complementarity and the potential for constructive synergy between both approaches. The research study itself and the democratic research model on which it is premised are outlined. Oberman goes on to present and discuss some key findings of the study relating to how children's knowledge of the wider world, dominant stereotypes, a literal reading of images and a tendency towards moral dogmatism, can limit their capacity to engage critically with text. In outlining the

teaching and learning resource developed to promote children's engagement with critical literacy, Oberman identifies how this resource responds to the findings and builds on children's emergent understandings of the wider world.

The question of stereotypes is again taken up by Richard Greenwood in Paper 5, which focuses on teaching about development issues in an ITE context. Greenwood suggests that while the Northern Ireland Curriculum supports exploration of different places, cultures and environments, classroom practice, particularly where it is premised on textbooks and commercially produced workbooks, can be characterised by stereotypical, over-generalised and superficial treatments of other cultures and places. Cross-curricular projects that challenge children's preconceptions can deepen their understanding of other places, as can carefully selected story books that enable children to imagine life in distant places. Challenging children's thinking around difference and similarity and developing their capacities to investigate can lead to a more complex understanding of place.

In the sixth paper of the proceedings, Thomas McCloughlin returns to the theme of integration and explores the potential of Byzantine Studies to support integrated learning in primary and teacher education contexts. McCloughlin identifies the potential of the Irish primary curriculum to support learning about and through technology and the creativity that lies at the heart of working with materials. He outlines the wealth of opportunities, which Byzantine Studies offers, for multidisciplinary and integrated learning across science, mathematics, geography, history and art. McCloughlin's study centres on a unit of work for second year students on a Bachelor of Education programme, which focused on the designing, making and testing of a mangonel – a siege weapon from the Byzantine period. The mangonel became the context through which students explored and deepened their understanding of tension. Through engaging with this process, students were encouraged to explore the relationship between technology, war and historical change, to consider the ethics of using war technology as a focus of learning with primary children and to challenge the gender stereotypes associated with technology.

Paper 7 addresses the area of peace education on the island of Ireland. Locating it within the broader discourse on the relationship between education and conflict, Benjamin Mallon begins by outlining the context for peace education in Ireland. He goes on to examine the typology of approaches to teaching about conflict developed by Davies (2005), focusing in particular on two approaches which contribute to education for positive conflict: the

promotion of cross-community dialogue and interaction and approaches which actively challenge violence through an interrogation of its underlying political and psychological roots and manifestations. Mallon's paper is based on the preliminary findings of a study which gathers data from a range of sources: curriculum documents; resources and materials; observations and focus groups. He identifies three emergent themes, which are evident in the literature and in the data i.e. the interface between education for conflict resolution at interpersonal level and in wider contexts; the potential and limits of contact theory and the agency of young people in the peace process. Mallon concludes by arguing that the Davies (2005) typology provides a rich framework through which to examine peace education generally.

Drawing on an empirical study carried out with undergraduate student teachers (Science Co-teaching in Science Education Project (SCITE)), Paper 8 examines student teachers' responses to the experience of co-teaching in the area of science. John McCullagh, Colette Murphy and Andrea Doherty begin by outlining the theoretical framework on which co-teaching is premised. Informed by Vygotskian theory, the framework develops the notion of co-teaching as residing in the zone of proximal development, characterised by the shared construction of knowledge and mutual scaffolding of learning and prompted by language-mediated interaction. The study profiled involved student teachers and teachers co-planning, co-teaching and co-evaluating seven science lessons over the course of a semester in the context of school placement. Student teachers' responses to co-teaching indicated that, based on self-assessment, the experience had resulted in increased competence across a range of areas related to planning, teaching and reflecting. The results of the study support the inclusion of co-teaching as a pedagogy of teacher education and suggest its relevance across the teacher education continuum.

In Paper 9, Maeve Liston considers the impact of technology on the practice of teaching, with particular focus on science education in the context of initial teacher education. The paper begins with an exploration of the policy landscape relating to ICT in education, and draws on national and European research to identify key issues relating to teacher education across the continuum. Liston goes on to examine the interaction between subject matter knowledge and pedagogical content knowledge in the process of science education at preservice level and considers the emergence of technological pedagogical content knowledge (TPACK) as a central component of knowledge for and of teaching. Having established a strong case for a focus on TPACK, Liston outlines in some detail the elements of an ongoing research project

which aims to investigate student teachers' engagement with TPACK and to monitor and evaluate a series of actions designed to embed technology across science education teaching and learning. Using a range of technologies and with clearly defined work packages, the project outlined promises to yield considerable insight into the interaction between TPACK, SMK and PCK in the context of initial teacher education.

Papers 10 and 11 are complementary papers, which draw on the findings of the SECURE project, a European collaborative research project which examines mathematics, science and technology (MST) curricula across 10 European countries. The SECURE study uses van den Akker's (2003) curriculum spider web as a basis for analysis and comparison. Interviews and questionnaires were also used to gather data. In all, 1,500 teachers and 9,000 pupils took part in the study. Paper 10 presents the rationale for the SECURE project which was to examine whether European curricula and practices in MST fulfilled their dual purpose i.e. the development of scientific, mathematical and technological literacy among the general population and the nurturing of future scientists. Having outlined the theoretical framework and methodology of this European study, de Meyere et al. go on to address some of the key findings of the research relating to curricula and practice. Using the European Union Key Competences (2006) as a frame of analysis, the study suggests that while the curricula in general display a concern with key competences, there is unevenness and little evidence of differentiation. In terms of practice, the paper goes on to address: the use of group work; context-based learning; the prevalence of practical work; the promotion of analytical thinking and communication skills.

In Paper 11, de Meyere et al. interrogate the data from a range of perspectives – the extent to which MST curricula are informed by a concern for social justice; the opportunities provided for the development of social skills; the nature of the science curricula; the status of environmental education and the engagement of teachers with continuing professional development. Both papers provide considerable insight into MST curricula across Europe and illustrate the importance of comparative studies of this kind as a means of progressing MST education for the 21st century.

The final paper in the proceedings returns to the question of using story, and, in particular, picturebooks, as a medium for development education raised in Papers 4 and 5. In a wide-ranging paper that gives us a comprehensive overview of a broad range of relevant children's

literature on the theme of asylum and migration, Anne Dolan draws on a wider research project to explore their potential for development and intercultural education.

Dolan begins by setting the context. Locating her study within a critical literacy framework, she goes on to explore how refugees and asylum seekers are presented in a range of children's literature, providing a concise summary of each publication. Dolan identifies emergent themes which she uses to categorise the storybooks i.e. personal testimonies; loss/loneliness; identity; resilience; the journey; departure; moving to a new country; challenging experiences in a new country and artefacts. In conclusion, Dolan argues the need for educators to be able to read the 'world' and become knowledgeable about development issues, if they are to realise the potential of picturebooks in the classroom.

Collectively, these papers present an overview of the themes discussed by the conference. While diverse in terms of the variety of themes addressed, together they offer some insight into the complex terrain of education in a globalised world. In identifying the need for critical engagement with that world, and the value of collaborative, active and dialogical learning spaces, the papers privilege those approaches which best prepares future generations for an unknown and challenging future.

THE WORLD TURNED UPSIDE DOWN

PRIMARY GEOGRAPHY IN THE TWENTY FIRST CENTURY

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ABSTRACT

As the pace of change accelerates in the twenty first century, making sense of the world becomes an ever more complex challenge. This paper considers some of the forces, which are operating on our planet, and the impact these might have on educational practice. Focussing especially on primary geography, it sets out a case for a positive and creative engagement with contemporary challenges and draws on recent research to buttress the case for an innovative approach to teaching and learning which will build children's capacity for an uncertain future.

INTRODUCTION

In 1800 an eccentric, Major Peter Labelliere, was buried on his head deep underground at Box Hill, in Surrey near London. Why? According to some sources he reasoned that as the world today is 'topsy turvy', he would be the right way round in the end.

I've called my paper the world turned upside down because it seems to me we live in 'topsy turvy' times when many old certainties are being challenged or called into question. In particular I want to highlight some of the forces which are shaping the world today and which seem to me to have a significant bearing on primary geography teaching. But before I begin I'd like start with a health warning. I recognise that in preparing what I want to say I have drawn on my interests and personal enthusiasms to synthesise ideas about geography education, the environment and the future. In consequence, I draw on ideas from many different domains. Covering such a wide spectrum inevitably presents challenges but on a more positive note it should also mean that there is something which will be of interest for everyone and that I will be making links and connections that you may not have considered before.

DISCUSSION

Planet Earth is around 4,000 million years old and approximately a third of its way through its geological life span. Scientists tell us that in due course the sun will become a red giant, the Earth will heat up and the seas will literally start to boil. We've been unusually lucky to

have had relatively stable conditions on Earth for millions of years. This has allowed different life forms to evolve. Human beings are one of these life forms and in geological terms we are very recent arrivals, dating back just a couple of million years. In that time not only have humans populated every continent on Earth, we have also developed the capacity to dominate other creatures and to mould our surroundings to a remarkable degree. We are now recognising that the decisions that we make and the way that we live our lives are starting to have planetary consequences. For those who are fearful for the future it means we may also be contemplating our self-destruction as climate change, species depletion and ever increasing human numbers combine to undermine our ecological base. Whether or not these problems are as serious as they seem, many people believe that environmental issues are without doubt the meta-narrative of our time. How and where do such matters feature on the school curriculum? They are relevant to many subjects but perhaps it is only in geography that they have a central role.

I have spent much of my career devising teaching materials of one kind or another for primary schools. One of my particular interests concerns primary school atlases. I have become fascinated by the world map, and the way that atlases have the potential to tell the story of the modern world. Each person carries an image in his/her mind about what the world is like. For nearly all of us, Britain and Ireland are at the centre of our mental image, and they occupy a convenient space at the middle of the page, somewhere towards the top. It comes as something of a shock, however, to realise that north doesn't have to be at the top and that planet Earth has no right way up. It also comes as something of a shock to recognise how distorted our image of the world actually is. Some parts of the globe are exaggerated with respect to others. Take the example of South America and Greenland. In terms of land area, South America is around nine times the size of Greenland but they are often shown as of roughly equal size. The distortion occurs not through inaccurate cartography but because attempts to portray an object which is three dimensional - the Earth - in two dimensions are bound to involve compromises. However, when we are exposed to this kind of distortion on a regular basis we quickly come to accept it as fact.

I am also very much aware that each of us has partial and biased geographical knowledge, which we have built up over a period of time from a mosaic of experiences. Some of our ideas are just plain wrong. A few years ago, I asked a group I had been teaching about Europe to shade an outline map to show the countries and territories which they thought belonged to Europe.

Out of a group of 60, less than half came up with results which were reasonably accurate. One student simply coloured Britain and Ireland, another thought that Europe consisted of Scandinavia, Britain and Spain while a third seemed to believe it stretched right across mainland Asia as far as the Pacific Ocean! Clearly while I thought I had been teaching and talking about Europe with particular boundaries and features, many of my students had had very significantly different images.

These are some of the observations, which have led me to recognise that we construct different narratives about places and that place is a complex concept that involves notions and time and space woven together in unique ways through our individual imaginations (Figure 1). Geography educators are increasingly recognising what might be termed the personal dimension to geography and the growing interest in childhood geographies is one expression of this trend (Catling, 2011). The hard chunky facts about the world which in the nineteenth and twentieth centuries seemed to offer a secure bedrock for geographical understanding have been replaced or supplemented by a realisation that much of our knowledge is contingent and contested. In curriculum terms, this implies the creation of meaning is every bit as important as remembering information.

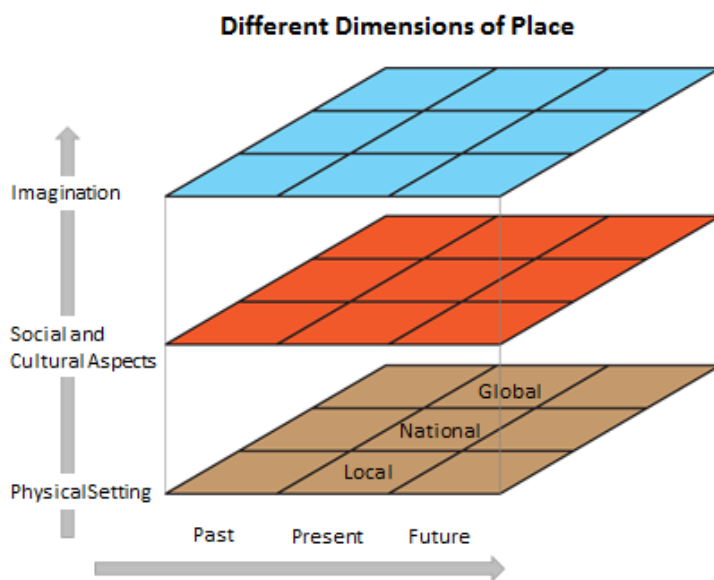


Figure 1: Our images of place involve not only time and scale but also individual imagination.

There are further problems with an over-emphasis on factual knowledge. In a fast changing world, more and more information is becoming available on a daily basis. Indeed, it has been estimated that three quarters of the knowledge, which will be available in 2050, has not yet

been discovered (Robinson, 2001). This presents educators with the conundrum of imparting knowledge for a future which cannot be known.

Building children's capacity to make sense of the world around them, to interrogate it and ask questions seems to offer a constructive way forward. At same time there is strong argument for building children's sense of identity. Neurologist Susan Greenfield (2003) has argued that one of the impacts of the electronic media will be to erode children's sense of self. Geographers, by introducing children to place in multiple and layered ways, can help to provide a balance. Indeed our relationship with our surroundings appears to contribute significantly to our personal happiness (Scoffham and Barnes 2011). The current interest in Forest Schools derives at least in part from this awareness.

In steering a route through these times of change I want to argue for a holistic, ecological approach which recognises our unique place in time and history. We need to explore our relationship with the natural world on many different levels. And in doing so we need to adopt an ethical stance which recognises the rights of future generations and the integrity of our relations with other human beings and forms of life. This is a challenging agenda but it is also an exciting one, which has direct relevance for geography educators. Booth and Ainscow put it this way:

The most fundamental aim of education is to prepare children and young people for sustainable ways of life within sustainable communities and environments, locally and globally...But 'ecological literacy' has to grow out of an understanding of, and respect for, nature, rather than a terror of catastrophe. It has to be linked to hope and optimism that hazards can be overcome (Booth and Ainscow, 2011 p.9).

CONCLUSION

I conclude by posing a range of questions to inform our discussion. As we reset the compass which will help us steer through times of great educational change three questions stand out:

- 1) What are we educating children for?
- 2) What are the values and beliefs that underpin our activities?
- 3) How will schools and educational institutions modify their practices in the face of overwhelming change?

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INTEGRATION WITHIN A 21ST CENTURY SCHOOL CURRICULUM: PURPOSE AND UTILITY

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ABSTRACT

Ideas of purpose and utility will be employed to consider aims, content and organisation of curricula and their relevance to children growing up in the 21st century. Consideration of debates about integration within the school curricula in the context of national and international imperatives and testing programmes draw on examples and practice of curriculum integration, involving science, at primary and secondary level in different countries.

INTRODUCTION

In a fast changing world technological developments have facilitated greater mobility and real time visibility of events around the world, with electronic communication providing different perspectives and personal accounts of these. Greater transparency and connectedness highlight global issues and events including: extreme poverty, climate change, conflict and over-use of non-renewable resources. Education in schools has to cater for uncertain futures within this globalised world. Decisions taken about knowledge and skills young people need to develop should assist in empowering them to play effective roles in both local and global communities.

Purposes of education

James and Pollard (2012) describe education as the product of the interaction between socially valued knowledge and individual development structured by school curriculum. Aims of education focus on: the individual; their interactions with others and with the wider world in the 21st century. Aims conveyed through national educational documentation include:

- overall educational aspirations e.g. promotion of pupil development and preparation for later life;
- expectations of the contribution of schools in economic, cultural, social and environmental domains; and
- curriculum and attainment expectations and aspirations.

Socio-political decisions generally result in a discipline or subject-based curriculum organisation. This is based broadly on the ‘structure of knowledge theory’ (Bruner, 1960; Schwab, 1964) that academic disciplines reflect human achievement and understanding and that teaching through these engages learners with content, processes and developing ideas within that discipline. This approach, however, may be problematic. For example the transition from ‘real’ to ‘school’ science often results in the subject being defined by concepts, facts and topics. This may fail to reflect both the on-going nature of the inquiry and knowledge-building processes within the discipline and increasingly cross-disciplinary ways of working.

A disciplinary approach to curriculum focuses on what content needs to be learned. This is, by default, teacher-centred and has been criticised as neither supporting learners’ understanding of how the real world works nor enabling them to apply their understandings to complex real problems or issues of interest to them and the broader community (Rennie et al. 2012). This is may be of particular relevance where concerns about poor motivation and engagement of young people within the science, technology, engineering and mathematics areas have been documented. Many young people are being educated in similar ways to their parents i.e. working on recognisable subjects including mathematics, science, history, geography in classrooms. The appropriateness of this practice in schools to a modern global society may be questioned.

PURPOSE, NATURE AND UTILITY OF INTEGRATED APPROACHES

Whilst curricula can be defined by their ‘nature, elements and practice’ (Dillon, 2009) an earlier framework of ‘purpose, experiences, and organisation (nature) and effectiveness (utility)’ devised by Tyler (1949) will be used here to consider integrated approaches.

Purpose

A more integrated approach to curriculum may reflect the non-compartmentalised nature of knowledge in the real world enabling alignment of education with young peoples’ future knowledge and skills needs. The selection of subject content would be dependent on learners’ needs rather than on the selection of subject matter to be taught (Beane, 1995). This more learner-focused approach might also provide a more humanist and meaningful school curriculum (Aikenhead, 2006). Integration encourages learners to utilise similar skills in

more than one area supporting appreciation of the interconnection of ideas. Making links beyond the classroom through the use of relevant contexts should support learning by providing the frame for ‘connection making’ and ‘meaning making.’ Flexibility in ‘problem-solving’ relevant to solving challenges in a rapidly changing world can be promoted. Resulting enhancement of motivation and ‘functional literacy’ enable learners to be flexible, self-disciplined, and to become increasingly able to anticipate problems.

Nature

Very varied approaches to curriculum integration in schools have been trialled and documented in studies over the last 40 years. See examples in Table1

Study	Models of integration
Fogarty (1991)	fragmented (<i>subject based</i>) - shared (<i>curriculum boundaries not evident</i>)
Kyselka (1998)	separate disciplines (<i>no integration</i>) - discipline based (<i>perspectives from different subjects</i>) - interdisciplinary (<i>discipline boundaries become blurred</i>) - total integration
Hurley (2001)	sequenced approaches (<i>two subjects planned /taught separately, in an appropriate sequence to provide cross-subject support</i>) -total integration (<i>two subjects taught together in intended equality</i>)
Applebee et al (2007)	correlated - shared - reconstructed

Table 1: Models of integration

There does not appear to be an all-encompassing definition of integration. Models described all share a gradation from subject-based approaches to organisation of curriculum around real world problems or projects of relevance to the learners with subject boundaries broken down. These may reflect simple alignment of timetables between subjects or a fundamental, refocusing on real-life issues and concerns.

The models reflect a view of knowledge as ranging between a ‘separate discipline-based’ paradigm and an ‘integrated knowledge’ paradigm. It might be interpreted as presenting a continuum with an implication that integration is ‘better’. This is contestable as there appears to be little evidence about ‘betterness’. Judgements need to be made against their purpose and involve some comparison with non-integrated approaches.

A study of integration within Australian and Canadian schools involved varied practices designated as ‘synchronised, thematic, project-based, cross-curricular, and community-focused’ (Rennie et al, 2012). Geography and science teachers collaborated to teach an energy topic in parallel in which cross curricular links and concepts were reinforced. Classes undertook extended projects including:

- working with a wildlife centre to develop understanding of living with tiger snakes culminating in a community presentation;
- raising chickens, in a project drawing particularly on elements of mathematics, science and technology;
- undertaking a module on access for disabled people.

The lack of a common definition of integration documented in earlier studies and identified by Czerniak et al (1999) as problematic for finding a common basis for the evaluation of integration in schools is still relevant.

Utility

Decisions about curriculum organisation require clarity of both purpose and utility. Judgements of effectiveness should be based on key purposes. An integrated approach might be judged by assessment of subject knowledge, understanding and skills, as in discipline-based approaches. However referral back to the purposes of integration would suggest the additional need for assessment of cross-disciplinary objectives such as problem solving or application of knowledge to real world contexts. Rennie et al (2012) propose the need for ‘multiple lenses’ (p57) including:

- integrated - to review interdisciplinary skills e.g. ability to transfer ideas from one context to another;
- discipline based - to consider the extent of learning of specific disciplinary concepts;
- sources of knowledge - to see how the learners access knowledge to make key learning decisions.

A judgment of utility might also include a comparative perspective, looking at challenges and gains from an integrated approach. Is learning easier because it is less disjointed and more relevant? Are knowledge and skills taught in a holistic way in meaningful contexts more memorable? Do they enable learners to apply learning to their lives and wider contexts?

Judgements of effectiveness and utility have also to be considered within the particular contexts. These include school and national curricula content and organisation and the structures and pressures of national and international standards, testing regimes and reporting practices. Additionally the challenges and gains integrated approaches present for teachers should be considered.

TEACHERS AND INTEGRATED APPROACHES

Many teachers favour the idea of a more holistic curriculum. However integrated curricula may require them to teach outside of their specialism or in new ways which can impact on their confidence and challenge their expertise. Broad topics and themes linked to a number of subjects present major challenges for ensuring progression and continuity of skills and knowledge in all related subjects. Teachers are subject to pressures relating to attainment and may need to be assured of the potential benefits to learners before adopting integrated approaches.

Participants within the European Fibonacci Project (<http://www.fibonacci-project.eu/>) explored approaches to integrating science inquiry across the curriculum. Work was underpinned by recognition of the need to consider how integration with another subject might support pupils' learning. The task was acknowledged to be complex. Success was likely to be dependent on:

- teachers' confidence teaching in both science and another subject;
- their content (substantive) knowledge and pedagogical content knowledge in both; and
- their understanding of the nature of science and inquiry-based approaches in science.

The need for a gradual process to move toward a whole-school cross-curricular approach identified by Jarvis et al (2011) underpinned the project. The aim was to enable teachers initially: to make good links between science and only one or two subjects; to look at the potential value for teaching and learning in each area; and to plan and assess progressive skills and concepts learning in each.

Offer & Vasquez- Mireles (2009) report teachers' beliefs that integration of mathematics and science in schools might strengthen content knowledge, promote flexibility in problem-solving and enhance pupil motivation. Some form of integration might contribute to learners' developing understanding of how and why mathematical ideas, are useful. Opportunities to

facilitate this understanding might be created in pedagogic tasks that have purpose for learners. Scientific inquiry offers a rich source of such purposeful tasks in which the utility of mathematical and statistical ideas can be embedded (Ainley et al. 2006). Mathematical ideas play an important role in the explanatory power of models in science.

A pilot study in England worked with pairs of teachers at primary and lower secondary level (4-13 age range) to integrate the teaching of mathematics and science through inquiry-based practical approaches, demonstrating the links between the two subjects. The responses and development of practice of the teachers in the classroom and school were monitored.

Engagement with centre and school-based activities provided opportunities for the teachers' shared reconstruction of understanding about aspects of mathematics, science and inquiry and overlaps between them. Development of their own procedural understanding included use of repeat measurements and averages and consideration of inquiry as an 'iterative' rather than 'linear' process.

Pedagogical content knowledge and understanding about teaching both subjects deepened. This was supported by greater focus on how mathematical awareness and understanding might enhance children's scientific inquiry and that scientific inquiry might provide a meaningful context and motivating purpose for mathematics. The potential for extended learning opportunities involving both mathematics and science was recognised. The teachers gained insights to children's understanding and needs and to their potential difficulties with: measuring; using concepts such as ratio and proportion; and transference of both knowledge and skills between the two subjects.

Teacher confidence and motivation appeared to be influenced by personal substantive and procedural understanding in both mathematics and science. Contextual factors such as curriculum structure and organization provided both support and limitations. Teachers were aware of the pressures of external assessment and accountability especially in mathematics for which there are precise national attainment targets in England. They needed to be confident about gains for children's learning to trial and develop ideas in school. The extent and depth of their work appears to be influenced by developing pedagogical content knowledge and by children's responses.

The teachers' collaborations reflected the benefits of them working in pairs. Where they collaborated closely, they shared expertise and experiences and developed a shared sense of purpose. This facilitated change of practice and supported their developing pedagogical knowledge. They developed ways of structuring and supporting learning in their own and each other's classes and, in some cases, began to influence practice in their department or school. For secondary teachers working with a colleague from another department was novel. Insights were gained to: practice and pedagogical approaches within each other's discipline; and also to pupils' responses within their colleague's area.

CONCLUSIONS

Whilst there is no encompassing definition of integration, nor conclusive evidence of its effectiveness, a pragmatic approach involving a curriculum with a balance between disciplinary and integrated knowledge may be useful. This would involve supporting the development of young people by leading them to look towards multiple dimensions whilst drawing on strengths offered by subject disciplines. This should better enable them to make connected sense of events in their lives in a 21st century world where knowledge is increasingly presented in a holistic rather than a compartmentalised fashion with sequential, pre-determined steps (Kyselka, 1998).

The professional development needs of both new and experienced teachers, whose personal educational experiences are likely to have been mainly discipline-based, should be a key consideration for curriculum planners. Teachers need support to exercise professional judgement about why and how they might contextualise, and extend their pupils' learning for a globalised world through integration. Teachers should be provided with opportunities to make decisions and to work together to arrive at appropriate solutions within their own school contexts. This should facilitate the development of clear objectives for their learners and allow them to judge the effectiveness of their approaches.

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EXPERIENCES OF AND LESSONS FROM TEACHING EDUCATION FOR SUSTAINABILITY

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ABSTRACT

The UNESCO Decade of Education for Sustainable Development, which came to an end in 2014, generated interest around the world in how education can encourage and enable people to play their part in transforming humanity's unsustainable practices at individual, local and global levels. However, Education for Sustainability (EfS) is still not widely accepted as an integral part of our education systems. In initial teacher education (ITE), where the most significant multiplier effect can be created, EfS is rarely addressed beyond the confines of particular courses or modules. In this paper we will share our experiences of teaching EfS to small cohorts of primary ITE student teachers in the UK and in Ireland, and will consider student responses to the various modules taught. We conclude that EfS at modular level remains limited. By working within the current systems rather than changing and rethinking these very systems that have created the problems, it does not allow for addressing the underlying values and attitudes. We argue that a more coherent approach is needed where EfS is addressed at a whole college level which will allow for critical thinking about education itself, the values underpinning it and the ways in which it happens.

INTRODUCTION

As we move towards the end of the UN Decade of Education for Sustainable Development (ESD) (2005-2014), it is pertinent to ask where we have got to in '*rethinking and revising education from nursery school through university to include a clear focus on the development of knowledge, skills, perspectives and values related to sustainability*' (UNESCO 2005a p 5). In an Irish context, while a draft National Strategy on Education for Sustainable Development (ECOUNESCO 2007) was published for consultation, it has not yet been adopted. One of its key objectives is to embed ESD at every level of the education system. With no particular top down structure in place yet, how are we as providers of teacher education embedding such practices in our programmes?

While there has not been curriculum reform and/or reorientation towards ESD in Ireland or England, Scotland has gone some way to embed and achieve these goals through its Curriculum for Excellence. Global citizenship, including ESD, is formally embedded within the experiences and outcomes of the curriculum and schools are being encouraged to adopt a

whole school approach to these issues – through the school values, ethos, school improvement plans and through engagement with the wider community. The General Teaching Council of Scotland now provides teachers from all school sectors the opportunity to gain accreditation for their work on sustainable development education. (UKUNESCO 2010). This provides a real buy-in for initial teacher education providers and their students.

From an international perspective, the following challenges to teacher education reorientation have been reported (UNESCO 2005b):

- Institutional awareness, support, and resources.
- Prioritizing sustainability in the educational community.
- Reforming education systems and structures.
- Establishing and sustaining.

This paper describes two case studies where an attempt was made to promote and embed ESD within ITE. One is part of the wider DICE project which aims to embed development and intercultural education as essential elements of ITE (DICE, Development of Intercultural Education within Initial Teacher Education 2013). The other is a stand-alone reorientation within a B.Ed programme in the University of Plymouth.

Case study 1:

This case study took place in the School Of Education at the University of Plymouth over one term in early 2010. The participants were 1st year undergraduate B.Ed. primary students, taking a specialism in science. Seventeen students, all whom were taking the module, took part. These students will graduate as qualified primary teachers who are also equipped to lead and deliver quality science across the primary school. The case study occupied 12 hours (excluding group preparation) within a 50 hour taught module called ‘Foundations of Science’. This particular module had gone through a review process that had led to it being redesigned to be delivered entirely through a problem-based learning (PBL) approach. (See Kelly and Cutting, 2008). As a result of on-going monitoring of this module, it was decided to review the second part of the module since the staff team felt the problems given to the students had lost some of their originality. Additionally, to address problems relating to the science of sustainable living (in part as it is ‘hot’ topic and due to the personal interest of the module team), this was the starting point for developing new problems with which the students were to engage.

The students initially visited the Steward Wood, Low-impact Community, Devon, UK. (Steward Community Woodland 2012). During the visit the students looked particularly at the science aspects of such living, with particular emphasis on power, food production and soil husbandry, as well as the nature of the construction of dwellings and the treatment of waste products. The following week the students visited the Forest Garden Project and the Permaculture gardens at Schumacher College, Dartington, Totnes, UK (Schumacher College 2013). Here they were encouraged to focus on the application of ecological principles relating to these alternative agricultural approaches to food production. Following the visits and debrief and review, the PBL element of the module was reintroduced. The students were then divided into groups and asked to research and present their findings on different aspects relating to identified practical science problems; these related to low impact living as observed during their time at Steward Wood and Schumacher College. Their research findings were then presented through the production of academic posters and by short presentations. The students were asked to critically evaluate their own learning and the potential that low-impact communities and sustainability science provided for a future basis for their own science teaching.

The overall findings of this case study have been described in more detail in Cutting and Kelly (2010). However, key findings relative to this paper will be shared. During the focus group discussion it became apparent that the students had never thought of sustainability science as a mechanism for the delivery of core science components of the National Curriculum. Indeed, most of the students had never covered any topic relating to sustainability or sustainable living in their pre-university science courses. There was some concern that environmental science may be too complicated, or too political a subject to form the basis for general science teaching and some felt that while science could play a role in the promotion of sustainability that there was a certain amount of ‘environmental weariness’ related to environmental issues. All students in the cohort however thought teaching science through environmental and/or sustainability issues was worthwhile and that teachers should at least try to apply science more to such issues. However, the students reported that while they had learnt about a number of issues relating to sustainable living, their personal behaviours had not changed and their approach to teaching science would also probably remain unchanged.

Case study 2:

CICE is a small college with a B.Ed cohort of approximately 100 students. ESD was initially introduced as an extra-curricular non-assessed course, and as such was taught in 2009 to a small group of 12 students. The following academic year, the DICE lecturer was invited to teach a 10 week non-assessed module to both 1st and 2nd years.

After an introduction to some basic ecological concepts of interconnectedness, these courses explored a range of issues relating to environmental sustainability with an emphasis on appropriate approaches to such topics with primary school children.

A survey conducted after Teaching Practice showed that students in both years had included a wide range of issues relating to sustainability in their teaching, mostly in geography, but also in science, history, English, SPHE and the arts. In the survey some students also mentioned their teaching of co-operative group work and its related skills, noting that these are skills needed for sustainability.

The following year, the course was offered only to 1st years. Thereafter, the 1st year timetable was deemed too full, and the ESD course was set aside. While some time was found over the following two years to deliver parts of the course, it lacked coherence, and the ad hoc nature of the inputs did not encourage students to consider it integral to their overall learning. The absence of any accreditation for this learning further marked ESD for the students as somewhat apart from the 'real work' of the college.

However, overall, evaluations and surveys showed that ESD attracted students for a range of reasons. The issues addressed in ESD were immediately relevant to them – to their lives, to their vision of their teaching and to the curriculum itself. They were aware of, if not previously very well informed about, some of the problems challenging communities – from litter to climate change - both locally and globally, and introducing such topics into their teaching made sense to them. Unlike in the UK case study, these students were not taking a science specialism, nor were the concept raised with them of teaching science, or any other part of the curriculum, through a sustainability perspective. Their teaching of ESD topics was simply an inclusion of selected sustainability issues into an otherwise 'regular' approach to the curriculum. Through the courses, the students developed sufficient understanding of some of the issues (the causes and effects of deforestation, for example, or water pollution) to give them confidence to introduce these topics into their teaching.

This interest was evident in the attitudes of the students to the establishment of a Green Schools committee in the college. This was met with enthusiasm, and the committee put time and energy into the completion of the various stages of the programme. While there was less learning about sustainability issues themselves on this programme, the students began to learn how to set about including a whole institution in a drive towards more sustainable practice, and became aware of the problems that arose when a whole-institution approach was not in place. Unfortunately, due to chronic staff shortages in the college, the college was unable to put in place the systems required to gain a flag, and the programme was brought to a close rather abruptly, leaving the students somewhat disgruntled and further confused as to the value of ESD in the education system.

They are not alone in this. Sterling (2008) comments:

‘Ever since the United Nations Conference on the Human Environment (Stockholm, 1972) education has been identified in international conferences, reports and agreements as the key to addressing environment and development issues. Yet, over three decades later, most education still makes little or no reference to these issues. At the same time, sustainability issues are becoming ever more critical.’

The ‘story’ of ESD in CICE would seem to illustrate how ESD, while generally considered ‘a good thing’, is not perceived to be an integral part of teacher education, while the University of Plymouth case study again shows the ineffectiveness of a single module approach. Enabling student teachers to learn about low impact energy or food production, or to construct lessons on subjects such as pollution or waste or global warming does not add up to ‘education for sustainability’, or ‘sustainable education’, the usage Sterling would prefer. Sterling insists that ESD not only demands, but is by definition ‘a change of educational culture, one which develops and embodies the theory and practice of sustainability in a way which is critically aware’.

So the question is begged as to what we really want ESD to deliver. Lessons *about* sustainability will not lead to a more sustainable society – education itself has to become sustainable. Anne Finlayson of SEEd (Sustainability and Environmental Education with the Sustainable Development Commission in UK) speaking at the Stakeholder Vision for ESD conference here in Dublin in 2009, called for a radical vision for ESD. She decried the ‘do this and save the planet’ approach where recycling is the answer, and called for a re-direction in the education system.

Much of the work in developing strategies for this to happen has already been done; for example, UNESCO has devised guidelines for the re-orientation of teacher education, as noted above; SEEd (SEEd 2008) produced an action plan aiming ‘to establish sustainable development as an integral part of how policy on children and young people is developed and implemented’, calling it ‘a non-negotiable for children’s well-being’ and listing six strategic priorities to meet this aim, involving all school staff, teacher education and the Department of Education in leading the way into a sustainable education system for the 21st century; the National Strategy Plan for ESD is completed but awaiting adoption (ECOUNESCO 2007).

There have been some successes with embedding ESD in programmes. Denise Summers and her team at Somerset College effectively embedded ESD in their Certificate in Education programme (Summers 2010). They adopted an action-research, co-operative enquiry approach. This involved each member of the team as co-researchers and co-subjects moving through a cycle of action and reflection (p. 37). As the team had different levels of knowledge and experience, albeit with similar values, the development required the team to share this and work together to consider ways to embed ESD across the programme. It is argued that the on-going discussions, reflections and sharing of ideas were essential for enabling the developments in the programme to take place. Part of this process involved discussions around the teams own professional identities, which naturally strongly underpinned their practice and how they felt about engaging with ESD. Despite the success and the many positive responses and actions from their students, some were less positive, suggesting that there was too much focus on ESD. Summers stresses that for success not only does the curriculum need to change along with teaching/learning methods, but also how the teacher’s own epistemology also needs to be challenged (p. 38).

CONCLUSIONS AND RECOMMENDATIONS

A piecemeal approach to ESD in ITE is ineffective. Responsibility must be taken by the colleges to ensure that sustainability is part of their ethos and that all students are not only introduced to ESD but are able to experience a culture of sustainability in their own education as teachers.

The Department of Education and Skills and the Teaching Council also have a responsibility to address the issue of sustainability and develop a framework for discussing and promoting ESD throughout the education system. The current reconfiguration of the B.Ed programme is

an opportunity to engage in discussion as to what it would mean for educational practice to become a 'servant' of the future rather than the past (Sterling, 2008).

Creative thinking and approaches to curriculum development and teaching and learning are needed if we are to be agents of change in the education system. For ESD to become an effective reality, a move beyond rhetoric to real words and action is needed.

We would recommend the following courses of action:

- Discussion paper clarifying the 'ESD' knowledge, values, skills and attitudes appropriate for primary schools and subsequent introduction of ESD as an integral part of primary ITE provision. This should include development of a set of guidelines for schools, and for teachers on embedding sustainability in the curriculum.
- Research identifying current ESD practice in Irish primary schools.
- IASSEE to take lead on the teaching of SESE through a sustainability lens.
- IASSEE to promote creative approaches to the teaching of SESE and in particular primary science.

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**From Research to Resource:
Critical Literacy and Global Citizenship Education in Middle Primary
School**

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ABSTRACT

Critical Literacy is considered one of the key skills in education for global citizenship (Krause, 2010; Bryan, 2008; Fielder, Gill, O'Neill & Pérez Pinán, 2008; Davies, 2006; Regan, 2006; Andreotti, 2006). Critical approaches to global citizenship education in particular suggest that challenging dominant ways of seeing and understanding the world is paramount to teaching for global citizenship and global justice (Andreotti, 2006). This paper considers the literature describing and defining critical literacy educational practice. In light of this theory, it assesses the shared and complementary spaces between critical literacy and global citizenship education. Using the findings of research into seven to nine year olds' engagement with issues of global justice, the paper goes on to make suggestions for the development of pedagogy which promotes children's critical literacy in a global citizenship education context.

THEORETICAL FRAMEWORK

What is Critical Literacy?

Critical literacy is said to be defined by its practice rather than prescribed pedagogic principles (McLaughlin and DeVoogd, 2004) and accordingly is variously interpreted in terms of content and emphasis (O'Brien, 2001; Comber, 2001; Kempe, 2001; Vasquez, 2001; Fain, 2008; Sahni, 2001; Damico, 2012). An assessment of this practice however, suggests critical literacy is rooted in two core principles. Firstly, critical literacy recognises that there are multiple perspectives on reality and that any single perspective is subjective and incomplete. Secondly, critical literacy acknowledges that the world is an unequal place and that the perspectives of some are dominant (Comber, 2001; Andreotti, 2006). With these ideological foundations, critical literacy as a pedagogy attempts to support learners' recognition of the limitations of the texts and messages they receive (Freebody and Luke, 1990). Furthermore, it seeks to introduce new perspectives and provide a platform for marginalised voices (Lewison, Flint and Van Sluys, 2002). These principles disrupt traditional educational practice. They undermine authority, encouraging learners and readers to question the messages they receive and to consider messages which are traditionally unheard (Kempe, 2001; Comber, 2001; Vasquez, 2001; O'Brien, 2001; McLaughlin and De Voogd, 2004).

What is Global Citizenship Education?

While definitions of global citizenship education vary there is broad consensus that it: supports an understanding of global justice and equality issues; links the local to the global; promotes action for social change and involves a values, skills and knowledge component (Regan, 2006; Krasue, 2010; Fielder, Gill, O'Neill and Perez Pinan, 2008). Andreotti (2006) differentiates between 'soft' and 'critical' approaches to global citizenship education. According to her, where soft approaches encourage responses to global inequality based on humanity and empathy, critical approaches look at the causes of injustice and promote engagement based on culpability. In addition, soft approaches provide learners with clear solutions or messages where critical approaches offer open spaces "without telling learners what to think" (Andreotti, 2006). An example of this critical approach is provided by the Open Spaces for Dialogue and Enquiry materials (OSDE)¹, which encourage the use of open-ended and analogous stories to support children's exploration of justice-related concepts.

While theoretical approaches to global citizenship education vary, research suggests that the practice of global citizenship education in school classrooms often falls short of the characteristics attributed to its good practice, across approaches. Studies looking at children's understandings of the wider world record limited awareness and stereotyped conceptions of developing countries. (Niens and Reilly, 2010; Bracken and Bryan, 2010; Wiegand, 2006; Barrett and Oppenheimer, 2011; Fiedler, Bryan and Bracken, 2011; Weldon, 2010). They suggest that children's global awareness is determined by personal as much as by educational experience (Bourchier, Barrett and Lyons, 2002; Holloway and Valentine, 2000). Furthermore these studies suggest that charity approaches, characterising 'developed' countries as benevolently aiding impoverished 'developing' countries predominate over educational approaches which explore interdependence and solidarity (Niens and Reilly, 2010; Bracken and Bryan, 2010).

Critical Literacy and Global Citizenship Education

The relationship between critical literacy and global citizenship education is not just one of compatibility and complementariness but of significant cross over. Both are concerned with perspective consciousness, power structures and marginalised voices. Where global citizenship education is concerned with justice, equality and empowerment in economic, social and environmental systems (Krause, 2010, Bourn, 2008), critical literacy is concerned with justice, equality and empowerment in the way we choose and read texts, messages and

symbols representing those global systems (Lewison, Flint and Van Sluys, 2002; Comber, 2002). It has been suggested also that critical literacy goes beyond the critique of dominant perspectives to include social activism, an understanding which brings it closer still to citizenship education (Lewison, Flint and Van Sluys, 2002).

Paulo Freire (1983) states that,

Reading the world precedes reading the word, and the subsequent reading of the word cannot dispense with continually reading the world. Language and reality are dynamically intertwined. The understanding attained by critical reading of a text implies perceiving the relationship between text and context (p. 5).

Freire's concept that to read the word you had to first read the world acknowledges the interplay between knowledge of the world and critical analysis of language. Taking these two areas of learning, this paper explores this interplay.

METHODOLOGY

This paper reports on research conducted into seven to nine year olds' engagement with issues of global justice. The research sought to capture data pertaining to children's conceptions of key global justice issues and also to explore how critical literacy pedagogies can be used to support global citizenship education.

The research was conducted in 2012 and involved four research visits to each of three schools in the broader Dublin area. The schools were selected to ensure, as far as possible, diversity of involvement. The first school was a rural multid denominational co-educational school with a significant diversity in terms of ethnic background. The second was a suburban boy's school under denominational patronage with some socio-economic and ethnic diversity. The third school was an urban girl's school with less socio-economic, religious or cultural diversity. One class in each school was involved in the study; this class was a first, second and third class respectively.

The research visits involved a 45 minute whole-class teacher led session followed by a 15 to 20 minute focus group session with between six and eight children from the class. The sessions were premised on approaches consistent with the ethics underpinning the research project. Accordingly, they attempted to provide meaningful learning experiences, multiple opportunities to ensure ongoing consent to participate and involvement of children and teachers in the research process, including in the interpretation of data (Nutbrown and Clough, 2009; Waldron, 2006; Fielding, 2001).

Session one involved the children looking at and answering questions on three photographs taken in different places around the world. Session two explored the terms: “fair”, “money”, “who decides” and “environment” and asked children to consider these terms in relation to the photographs. Session three sought responses, oral and written, to a PowerPoint story. The story had a nonspecific location and included themes of justice, environmental exploitation, decision-making and wealth. In the fourth session, children interpreted each other’s stories in an attempt to avoid what has been described as adults interpreting “student speak” (Morrow and Richards, 1996).

The focus groups were researcher-led and provided an opportunity for deeper questioning around children’s understandings and responses to the themes. All sessions were recorded, transcribed and analysed using a grounded theory approach (Glaser, 1976).

THE RESEARCH FINDINGS

The research findings provide insight into children’s conceptions of the wider world, key justice issues as well as strategies for supporting critical literacy and global citizenship education in middle primary school. Key findings relating to the interplay between children’s understanding of the world and their developing responses to representations of the world are discussed here.

Knowledge of World: Emergency Appeal Conceptions

Consistent with previous research on children’s developing world knowledge, children in this study predominantly were able to name neighbouring countries individually, but only larger areas or continents beyond that (Wiegand, 2006; Barrett and Oppenheimer, 2011). Research findings highlighting the significance of children’s personal experience in dictating their awareness of the world were also supported by this study (Bourchier, Barrett & Lyons, 2002; Holloway and Valentine, 2000). The countries with which the children in the study were familiar were popular holiday destinations (France, Spain and Portugal) or else countries to which Irish people often emigrate (England, America and Australia). Of developing countries and of emerging economies, it was principally Africa to which children referred.

This, in itself, raises questions, as to why Africa is so much more familiar to children than other continents in the Global South, as well as highlighting children’s limited knowledge of the emerging economic superpowers.

For the purposes of this paper however, the research provides evidence not only of the dominance of stereotypes in the children’s

understanding of Africa but of the essentialist character of these stereotypes and of children's understanding of poverty.

Like previous studies, this study found children to hold understandings of countries in the Global South premised on common stereotypes (Fiedler, Bryan and Bracken, 2011; Weldon, 2010). Children referred to people in Africa as being poor, having to travel far to get water and not having any clothes or food.

Jack: I rubbed it out because I put Africa in.

Researcher: And what do you think?

Jack: It's not Africa.

Researcher: Why?

Jack: Africans don't have homes

Phillip: Because in Africa they're black and they kind of have no food and they have no water. You know like we have food and water"

(Setting 2, Session 1)

As this quote illustrates, children's conceptions of Africa were both strongly held and extreme, in terms of associating Africa with acute, famine-like deprivation. Where children were shown images projecting people living in deprived and vulnerable situations, but not in famine, the images challenged the children's understanding of Africa, as is indicated in the quote above. These findings suggest, not simply that children characterise Africa as poor but that their understanding of poverty itself is defined by their understanding of Africa.

Children understood the photographs to be taken in Africa because they felt the people in them looked poor. They understood the people to be poor because they believed the pictures to be taken in Africa. Accordingly, they showed limited knowledge of poverty existing outside of Africa. These findings suggest, not only the value in exploring, with children, different perspectives on different countries but in deepening and widening children's understanding of social and economic inequality

Linking the Word to the World

The importance, outlined by Friere (1983), of reading the world to understand the word, was highlighted by this study, where children's limited global awareness restrained their ability to engage critically with the photographs or the PowerPoint story as representations of reality.

The children in this study engaged in meaningful discussion in relation to the issues raised in the PowerPoint story and wrote responses to this story. However, their limited familiarity with the situations of global justice reflected in the story, prevented exploration of how the PowerPoint story represented the ‘real world’. Similarly they were unable to question how “typical” the photographs were of the people and places they captured. Predominantly they understood the photographs to be a complete and accurate portrayal of their subject matter. For example, in one of the photographs used, a child wasn’t wearing long trousers or shoes. In their discussion, the majority of children assumed that the child had no trousers or shoes rather than arriving at other explanations as to why the child might not be wearing this clothing. Only one child, who had travelled outside of Europe, suggested that the boy might have trousers but might not be wearing them because it was hot. These findings highlight the value of using texts capturing familiar contexts as advocated by Comber (2002) and indicate the challenges of conducting critical literacy work with texts representing distant and different contexts. They suggest a need to develop global knowledge to facilitate global critical literacy.

Dogma and Dilemma

The study is insightful with regards to children’s moral reasoning at this age. Children in their response to the PowerPoint story discussed the virtue and vices of the characters’ treatment of the environment, their relationship with money and their behaviour to each other as well as predicting how the characters were likely behave in the future. They also discussed and critiqued the possible involvement of the police in enforcing and preventing certain actions. To this extent the study indicates children’s enthusiasm for moral discussion (Coles, 1997) and their ability to think beyond rule-bound morality (Russell, 2007; Coles, 1997).

However while there was evidence of children’s growing engagement with moral thinking, the tone of the children’s discussion was highly dogmatic. The children, in general, judged the behaviour of the characters in the PowerPoint story on grounds that they were ‘mean’ ‘selfish’, ‘not kind’ or ‘not sharing’. The discussions suggest that children, in judging moral acts, tend to focus on the intention behind the act rather than its consequences. The results here indicate the need for teachers to challenge children to consider wider philosophical and moral questions, such as what makes people act the way they do, the implications of different actions and who benefits from different situations.

A Resulting Programme

The research study has informed the development of a programme for supporting critical literacy and global citizenship education in middle primary school. The programme, called Just Children 2, responds to the key findings set out above and negotiates some of the issues raised. The programme involves children reading and reviewing an illustrated storybook called *Farid's Rickshaw Ride*. The story is set in Bangladesh. After reading the story the children work through cross-curricular activities which provide different perspectives on Bangladesh. The activities support the children in exploring the issues raised in the storybook but also to recognise the limitations of the storybook as a representation of reality. The storybook depicts a boy's journey around Dhaka and through different literary mechanisms includes perspectives on Ireland, insight into different Bangladeshi livelihoods and open-ended discussion on transport and human rights issues.

A brief overview of the story is as follows: Farid's cousin is visiting from Ireland. Wearing the Irish jersey, sent to him by his cousin, Farid travels by rickshaw around Dhaka to collect flowers, fish and blankets. During the course of events, Farid learns about the past experiences of the rickshaw puller, which provide insight into the lives of those touched by climate change and global trade. Then the rain comes and an accident overturns the rickshaw and leaves the rickshaw puller in trouble with the police. People on the streets discuss the possible consequence of the accident for the rickshaw puller and debate how rickshaws should be provided for in road planning. Meanwhile Farid seeks comfort and runs for home. When the rickshaw puller pays a visit later, Farid is better able to advocate for the puller and learns that his Irish jersey was in fact made in Bangladesh.

The programme responds to the findings of the research study in several ways:

Representation of Ireland: Knowledge on Bangladesh

As set out above, children's ability to engage critically with material is compromised if they do not have sufficient knowledge of the reality represented in that material. While Comber (2001) suggests using local cultural texts to overcome this problem, this programme, wanting to engage with global realities, advocates a two-pronged response.

On the one hand, it includes representations of Ireland and encourages children to critique these against their own experiences. Simultaneously, it supports increased exploration of Bangladesh, the country and people, represented in the story. Exploring different perspectives on Bangladesh while engaging critically with different representations and experiences of

Ireland, is intended to facilitate a more critical engagement with images of the global south.

Contextual Certainty but Moral Inconclusiveness

In contrast to the PowerPoint story used in the research, the storybook is set in a specific location and includes, not only illustrations, but photographs. While a work of fiction, it is research-based and the issues it depicts respond to researched and/or documented global justice issues. In addition to the storybook, the programme provides further information on the location, highlighting the realities represented in the storybook. To this extent the programme contrasts with the pedagogy used in OSDE methodologies. There, the stimuli used are abstract and use analogy to explore philosophical moral concepts. In its factual and contextual approach the programme facilitates children's learning about specific people, places and themes. However, in common with the OSDE methodologies, the storybook raises moral questions, which it does not attempt to answer. Consistent with critical, as opposed to soft, global citizenship approaches (Andreotti, 2006), the story offers different perspectives on global justice issues rather than providing clear messages or solutions.

Multiple Mediums of Information

A further aspect of the programme which facilitates the children's critical engagement in circumstances where the story's setting is unfamiliar, is the inclusion of different mediums of information. The storybook itself includes illustrations, photographs and comic strips. The programme includes, in addition, adverts, news extracts, graphs, maps and tables amongst others. The programme encourages children to explore the subject of Bangladesh through contrasting genres and perspectives, enabling them to engage with the limitations of each individual representation and to build understandings based on complexity and multiple viewpoints. Furthermore children are asked themselves to write, choosing from different genres and thereby engaging with how an author's purpose, audience and intention shape the development of the text.

CONCLUSION

Critical literacy supports global citizenship education in challenging dominant conceptions of the world arising from historic and continuing structural power imbalances. However critical literacy in a global citizenship education context presents challenges. Freire's (1984) contention that to understand the world you must have knowledge of the world identifies the concern presented where "the word" involves aspects of "the world" with which children are unfamiliar. This paper suggests methods for addressing this challenge and facilitating critical responses to representations of unfamiliar places and global issues. These methods include the comparison of different genres and perspectives, juxtaposing the familiar with the unfamiliar and the inclusion of inconclusive discussion and debate on moral issues. These methods support an approach to global citizenship education which is creative, complex and critical.

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TEACHING STUDENT TEACHERS ABOUT DEVELOPMENT ISSUES IS IT POSSIBLE TO AVOID STEREOTYPE AND PREJUDICE?

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ABSTRACT

There is a concern that when teacher education students teach, as part of primary geography classes, about countries which are less developed than UK/Ireland or about topics such as 'Homes in Other Countries' etc. that they leave their pupils with stereotypical/ prejudiced notions and concepts about those countries. Some of these stereotypical views can be magnified in children's minds by charity marathons. This paper explores a series of questions: How do teacher educators help student teachers to find the balance in the above? Is talking about 'localities' better than talking about countries? What resources can help? Are story books useful in this?

INTRODUCTION

'The requirement to study distant places is perhaps one of the most problematic areas of the primary school curriculum. It raises questions about stereotypes and prejudices ...' (Scoffham and Potter, 2007, p.5).

Children today have more access to 'windows on the world' than older generations had at that age. They can be bombarded with visual and verbal information from TV and the internet via programmes aimed at them as well as at adults, produced by, for example, charities and concerned groups – information about other countries, distant places and other people's lifestyles. This being so, how do we as teacher educators prepare our students to deal with the potential issues of stereotyping and prejudice which may be raised? A number of authors in recent years have written about the problems faced by primary school teachers as they attempt to teach their pupils about other countries and cultures while avoiding 'the danger of the single image' (see Griffiths and Allbut, 2011). For example, some have explored the probable sources of and the nature of pupils' stereotypes (Graham and Lynn, 1989; Harrington, 1995; Gill, 2002) and some have looked at ways in which these attitudes might be challenged and amended (Willis, 2005; Borowski, 2011).

This paper describes the aspects of the Northern Ireland Curriculum which might involve teachers in planning and delivering lessons on other countries and cultures; it then goes on to suggest how ‘country projects’ can be vehicles for useful cross-curricular work and the development of pupils’ group work skills and thinking skills; finally, the benefits and potential dangers of using story books when teaching about life in other countries will be discussed.

DISCUSSION

In the Northern Ireland Curriculum (CCEA, 2007) there are a number of statements in the Area of Learning called ‘The World Around Us’ (WAU) which encourage teachers to provide opportunities for pupils to develop: ‘... *an awareness of themselves and their place in the world as well as of other places, cultures and the environment*’ (CCEA, 2007, p. 83). Beneath this ‘umbrella’ statement are more detailed statements including suggestions that pupils should learn about, for example: *the life of a child in a contrasting location, including similarities and differences, such as homes, schools, events and celebrations; comparisons between the local area and a contrasting place; weather in the local area compared to places that experience very different weather conditions; the effect of extreme weather ... on people and places.* Within the curriculum’s focus on ‘Thinking Skills and Personal Capabilities’ (TSPCs) it is suggested that pupils should, for example: *identify similarities and differences between a range of features and places, offering explanations for ... weather, house types, building materials; examine evidence and opinions from a range of sources, distinguish between fact and opinion, for example researching information about life in another country; use role play and drama to explore issues, challenge perceptions, stereotypes and assumptions and develop empathy with others’ viewpoints...* (The Northern Ireland Curriculum document and the TSPCs can be viewed at www.nicurriculum.org.uk).

These types of statements are frequently worked out within lessons which come under the label ‘geography’ within WAU, often within topics such as ‘Homes’ or ‘The Story of a Product’ or ‘Fair Trade’ or within projects about a particular country or a location within a country. Using textbooks or pre-prepared worksheet material in an unthinking way within such topics, teachers can either sidestep completely the controversial issues which may potentially arise, or can reinforce already firmly held stereotypical and prejudicial ideas. Teachers (and teacher education students) need to be aware that resources such as worksheets

may in themselves inadvertently reinforce stereotypical views, especially if the material is part of a larger pack of resources and is used out of context.

There are many commercially produced worksheets on the topic of 'Homes in Other Lands' which contain images, for example, of mud huts; while these types of buildings are common in many countries, we do not want children to be under the impression that 'everyone in Africa lives in mud huts'.

Class projects about a particular country can be criticised as being over-generalized and focusing too much on factual information; if this is so, then the potential for stereotype and prejudice is great. On the other hand, country projects - ideally involving countries with which either the teacher or some of the pupils have a personal interest or connection - provide great potential for pupils to carry out directed group or paired work which involves them researching for and synthesising information, creating written work of various genres, creating art-based and ICT-based material, and communicating the results of their research in various ways to the rest of the class. This kind of work has a natural cross-curricular focus and allows the development in a meaningful context for work in many of the NI Curriculum's TSPCs as well as the new 'Using ICT' area of the curriculum. I always recommend to my students that they start a project such as this with a 'KWL' activity, getting the pupils to state 'up front' what they **K**now about the country (or think they know!) and list what they **W**ant to find out during the topic. At the end of the topic, as they discuss what they have **L**earned, the pupils' initial ideas can be re-visited, and at this point a discussion in a very real context can be had about the prejudicial notions which may previously have been held by the pupils.

Story books can be extremely effective in helping children visualise and begin to understand aspects of life in distant places. This is especially the case for younger pupils. Dolan (2013, p. 31) suggested that story books: '*... provide children with a range of windows through which they can view the world*' and '*a range of different geographical perspectives can be filtered into the world of the child through the virtual lens of picture books*'. These geographical perspectives can be developed by looking at, for example, everyday environments, distant environments and environmental issues.

Three story books, all set in Kenya, illustrate some of the uses and some of the potential problems surrounding stories about less developed countries. '*Masai and I*' by Virginia Kroll is beautifully illustrated with double-page spreads comparing life in the UK with life in a Masai area in Kenya.

In each block of text the little girl in the story says: *'If I were Masai I would ...'*. In *'Handa's Surprise'* by Eileen Browne another very positive view of life in Kenya is depicted. The country provides a rich fruit harvest and the wildlife is varied and fascinating but seemingly harmless. In both of these books the country of Kenya is portrayed in a bright and colourful, positive light, emphasising family and community friendships, happiness and wellbeing. In an article in *'Primary Geographer'*, Bates and Pickering (2007) wrote about the reactions of one class of seven-year-olds to being read *'Mama Panya's Pancakes'* by Mary and Rich Chamberlin. Their comments throw light on all three stories. Stereotypes about life in Africa were evident among the children in the class, and following a series of lessons based on the story, Bates and Pickering concluded that: *'It clearly takes more than a few lessons for children to reassess pre-learned notions of distant places'* (p. 18). However they also went on to say: *'... in challenging children's pre-conceived ideas of a distant place we must avoid simply replacing them with a different, idealised stereotype'* (p. 19). In addition they raised the issue of children's perceptions of 'stories' as fiction as opposed to stories based on real places. In the three examples given above, *'Masai and I'* and *'Mama Panya's Pancakes'* are realistic and plausible, while *'Handa's Surprise'*, with its animal involvement, is very definitely a fictional story. All are interesting and instructive, but the problem remains that children may not be able to distinguish between the two styles. Bates and Pickering (2007, p. 18) ask: *'Why should we expect children to be able to distinguish fact from fiction in a story, particularly when the warm, lively, description of Kenya that they hear in class is so different from the dependent and poverty-stricken picture of Africa so prevalent in the media?'*

CONCLUSION

Bates and Pickering argue that if children are old enough to have developed an idea of a distant place, then they are old enough to have that idea challenged. As teacher educators we can encourage our students to challenge pupils to think again about a place, to investigate further, and to develop a deeper, more complex understanding of that place. In doing so the pupils will begin to understand the commonality between people and places and not just the differences.

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Sailing to Byzantium: “Byzantine Studies” as an exemplar of integration of SESE and mathematics

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ABSTRACT

Science, history and geography education all lay great emphasis on the role of evidence in forming knowledge, beliefs and values. Furthermore, skills development is built into the curriculum as a parallel channel in each of the subjects in order to develop “authentic learning”. These attributes to curriculum attempt to move away from the “tyranny of pure content” enshrined in a historical cultural mindset which lays great emphasis on “knowing stuff”. In addition, the applicability of the constructivist approach to historical and geographical knowledge, in addition to science, means that the three ‘environmental’ subjects – in the broadest sense – have much in common.

‘Paraconceptions’ – those conceptions that go beyond the formal subject matter taught in school – are integrated in the real world; however, schooling promotes fragmented and primitive conceptions which although mathemagenic may nonetheless be conceptually distant from the paraconceptions that may be planned as outcomes. This work concerns the on-going development of a unit of work with 2nd year B.Ed students, for the upper primary school, and beyond, which examines the scientific and technological situation in the Eastern Mediterranean in the Medieval Era. Issues of justice and equality are also explored in examining the use of military technology in history and whether wood technology is gendered. Working models of mangonels – simple siege weapons much used in the Ancient and Medieval Eras – were produced with which to conduct simple science experiments. This provided an opportunity for integration with history, geography and mathematics and challenged certain misconceptions in history relating to the Normans and the Roman Empire. Post completion evaluation of the unit of work was provided by the students using personal response devices, n=130, and the results have implications of how student teachers approach teaching practice and their view of novel teaching methods.

We have the technology

The term technology itself comes from the Greek *techne*, meaning art/craft, and *logoi*, meaning word/s or study. In the Irish republic, primary education integrates technology into science throughout the primary schooling (4 - 13 year old); post-primary education provides subjects of study in the Junior Certificate (13 – 16 year old) which are separate from science such as materials technology; i.e., woodwork and metalwork, plus the general subject technology; and engineering in the terminal examination, the Leaving Certificate. However in the England and Wales curriculum and the Northern Ireland curriculum, technology and science are combined to make Science & Technology. We also hear of ICT i.e., information and communications technology.

Art overlaps with technology in the form of ‘craftwork’, and technology also refers to things like food technology and textile technology, i.e., Home Economics, or textiles and ceramics. What all these domains have in common is the study and application of the properties of materials, which, when worked on by humans, result in artefacts.

At the post-primary level, the processes of designing and making artefacts have been part of syllabi in Ireland and other countries for many years now, in a subject all to itself called "technology". There has, however, often been much disagreement as to the appropriate content to be included in it. The use of the word technology in the primary curriculum is general; it may refer to ICT or woodwork, metalwork, food or any material that can be used to execute a design, but its main role has been to expand science concepts and place those concepts within a context, since concepts are normally encountered in the ‘real world’ within a context. Indeed, one of the problems of ‘school science’ is that the concepts are often decontextualized, and assumptions made that learners can automatically apply the concept they encounter to the appropriate and relevant context. This is often not in fact the case.

The role of materials is key to the development of technology. History and archaeology delineate human culture according to the dominant material culture technology of the time: Stone Age: palaeolithic, mesolithic, neolithic - stone tools and weapons predominate; Copper Age: chalcolithic - first extraction and use of copper in toolmaking and weapons; Bronze Age: bronze and other metals predominate in art, cooking and weapons; Iron Age: iron and, later, steel as the main metal of weapons and cooking. The question arises as to how the current “Age” will be viewed by history, as it could be considered as the Plastic Age, the age of Crude Oil or the Digital Age. It must be recognised, and this will be discussed later in the paper, that many material-based cultures are concerned with the material of weapons, for hunting and, later, for war.

The curriculum strand called *Materials* in the Irish primary science curriculum is key to teaching about materials and is one of the most important strands in connection to technology. The other important strand is called *Energy and Forces*, since many artefacts ‘do’ something; forces are employed whether by involving beams, levers, wheels/axles or other simple machines and mechanical forces, or the force of magnetism

There is a large measure of agreement over what kinds of processes are included in the design of an artefact or a system. Design is a key element of technology and every object we use or see was designed by someone sometime.

The design for an innovative object is typically patented which acknowledges the designer as the originator by right. Inventors, architects, and innovators are designers. Design, whether innovative or not, is not a random process but a process that consists of a number of steps, though not all people agree on the number, or on what constitutes a bone fide step. One of the key elements in design is often “inspiration” or “intuition” and these are difficult to describe or quantify, but very often these draw on extensive experience within the domain; hence when Eddison in 1902 stated: “genius is one per cent inspiration, ninety-nine per cent perspiration”, he was articulating a recognised truth. However, in the primary curriculum strand *Design and Make* (NCCA, 1999), we see that there are two main types of activities as well as two general types of design; however discussion on the types of design and what is done in school is beyond the scope of this present work.

“Sailing to Byzantium” Integrated Lesson Map

Byzantine Studies is a multidisciplinary branch of history that describes any aspect of the Byzantine or Later Roman Empire: 330 – 1453 C.E., and the aspect examined in this work is “military technology”. The theme for this work is ‘Byzantium’ and here I follow Beane’s (Beane, 1992) model - moving away from the subject approach, I identify a central theme, and ask what each subject area could contribute to it (Figure 1. and Appendix A). Byzantium was chosen as a theme because I was personally interested in it. In my spare time I am a Byzantine Iconographer ‘writing’ Orthodox icons in the pre-renaissance style. This involves making wooden panels, covering them with linen and gypsum and painting with natural mineral pigments suspended in egg yolk and vinegar. Associated with the writing of icons are a large number of areas that appear to impact on the artform that Byzantine Iconography manifests. While none of these areas appear to be taught in primary or secondary school, a ‘deeper’ and ‘tangetical’ investigation of the primary Science (NCCA, 1999) curriculum revealed a wider degree of relevance; thus the lens through which the curriculum is channelised has a large impact on its implementation. The following concept map outlines how Byzantine studies would be an interesting topic in Social Environmental and Scientific Education (see Figure 1).

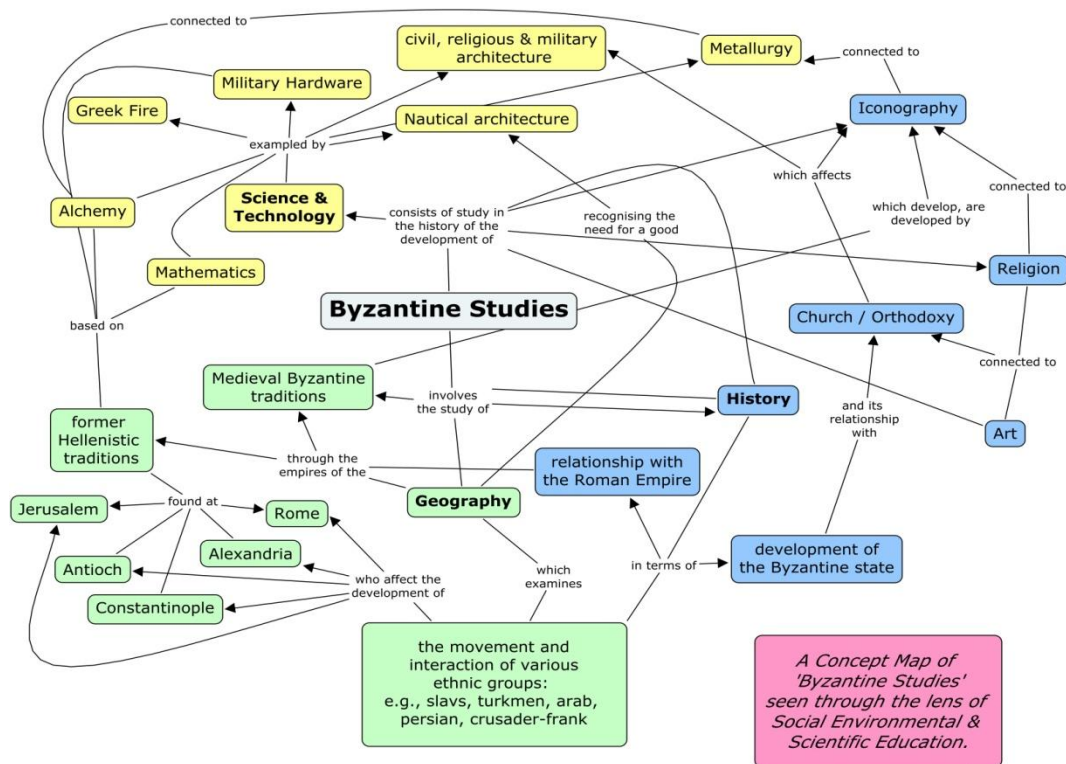


Figure 1. How the mangonel lessons fit into an overall integrated concept map

It seemed to me that I could use the theme of Byzantium as a fresh domain where little previous knowledge might ‘impinge’ on the learning. Most of the students had heard of Byzantium from the Yeats’ (Yeats, 2013) poem: ‘Sailing to Byzantium’ and thought of it only as an allegory of growing old. For my own part, my inspiration was aroused having read the *Alexiad* by Anna Comnena (Κομνηνή, 1148). I focussed on a small number of areas initially such as “what is Byzantium?” – note the use of the present tense – “where is Byzantium?” which would involve some degree of history and geography and then move to a design and make activity in science. However, this reflects the typical approach to integration – which involves teaching “a little bit of this, a little bit of that, and then let’s do some science”. This is the so-called piece-meal approach, which can also be accompanied by one subject being seen as the superior, more useful or dominant area rather than believing that “all domains of human experience are worthy of investigation” (Australia, 2005).

Even when it is recognized that all domains of human experience are worthy of investigation, it is patently impossible for all children to explore in any meaningful way ‘all domains of human experience’. The learning outcomes of *Sailing to Byzantium* must offer something else beyond an alternative approach to content in science; a deeper experience of *Design & Make*; or an integration of mathematics and science with a ‘sliver’ of history and geography. *Sailing to Byzantium* seeks to achieve those aims just listed, but it seeks also to redress a large

gap in historical understanding of the “East”: Eastern Europe, the Middle East and the background of the current complexities such as the Kosovo question; the *de facto* partition of Cyprus; the accession of Turkey to the European Union; the Arab Spring; the Syrian conflict; and the Palestinian-Israeli question. All are aftershocks of the collapse of the Ottoman Empire – which contained the same issues in pressure-cooker fashion – and which ultimately originated in the Byzantine era.

Research indicates that using an interdisciplinary or integrated curriculum provides opportunities for more relevant, less fragmented, and more stimulating experiences for learners (Frykholm & Glasson, 2005; Jacobs, 1989; Koirala & Bowman, 2003). More and more educators are coming to realize that one of the fundamental problems in schools today is the “separate subject” or “layer cake” approach to knowledge and skills. Often students cannot solve problems because they do not understand the context in which the problems are embedded (Frykholm & Glasson, 2005).

This paper is based on the development of a unit of work in designing, making and testing of mangonels conducted by a class of 2nd year Bachelor of Education students in St. Patrick’s College, Dublin. The students were encouraged to devise their own experiments; a total of six varieties of experiments can be performed based around the tension or height of the skein or the size/shape/weight of the projectile. Results of the testing of mangonels were documented and inputted into an excel database. Post completion evaluation of the unit of work was provided by the participants using written personal reflection assignments.

It needn’t be hell with mangonel

A mangonel is an early medieval or ancient siege weapon consisting of a frame – the simplest being two rectangular frames at right angles – with an elastic called a “skein” stretched between the uprights and a spoon-like holder inserted in the elastic to throw objects such as small blocks of wood. Production and evaluation of the mangonel can extend to a whole lesson in itself based on testing the mangonel. The mangonel can be used to test several hypotheses: i) the greater the tension in the skein, the further the projectile is thrown (the tension is measured using a forcemeter pulling back on the ‘spoon’ in Newtons), though the numbers of turns of the skein also provides an informal measure of tension).

Figure 2 illustrates a typical set of results while, Figure 3 shows the positioning of the forcemeter; ii) the higher the skein is set, the higher the projectile is thrown; iii) the more

elastic bands used to make the skein, the greater the distance the projectile is thrown: this illustrates the problem of fair-testing - it depends on the tension, though a greater tension can be achieved, to a limit; iv) the larger the missile, the shorter the distance it travels; size of the missile as a variable can be explored in a number of ways whether by increasing its aerodynamic drag significantly or using multiple projectiles wrapped together or glued together. If the skein is wound too tight, i.e., the tension is too great for the construction, the mangonel experiences catastrophic failure.

RESULTS

A graph of tension in the skein of the mangonel versus distance the projectile travels

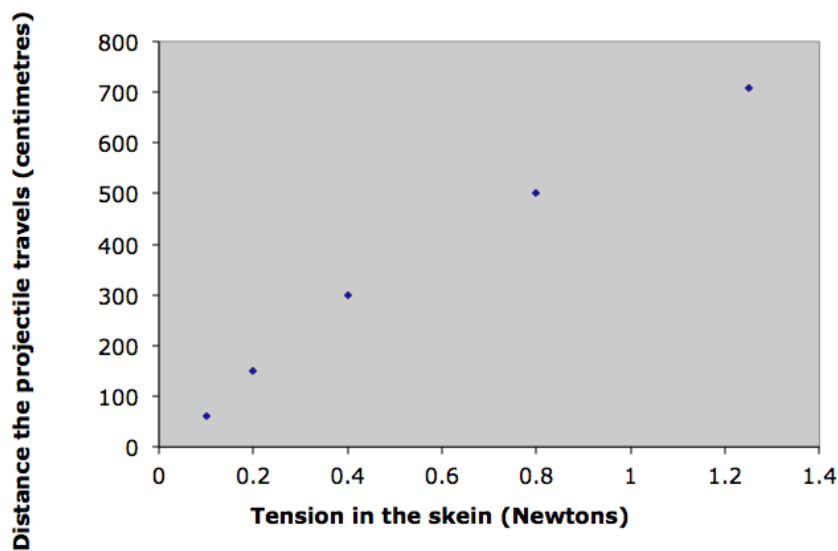


Figure 2. Typical graph in EXCEL of the tension in the skein versus the distance the projectile travels

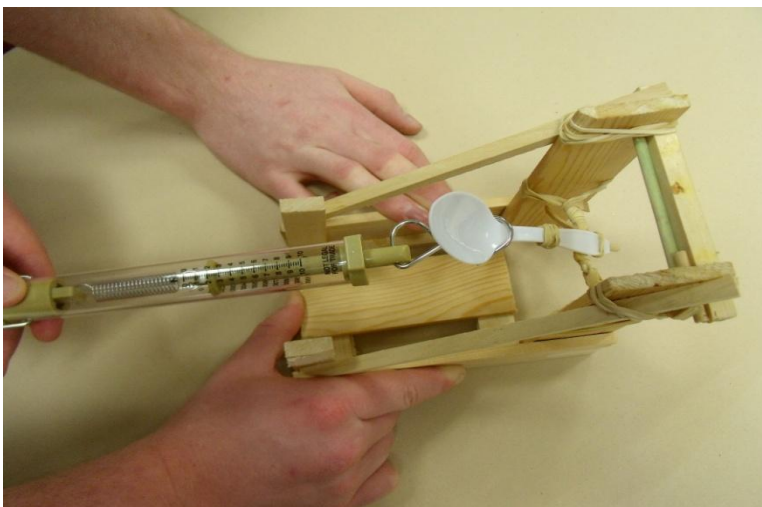


Figure 3. A mangonel being used in an experiment on tension

In general, the students rated the use of the idea of making a mangonel as worthwhile, and the use of wood as generally a good thing. Some students do ask if alternative materials can be used, and whether certain plastics could be employed; however, these are specialist materials and would have a cost implication as all of the materials for the mangonel activity were sourced locally in hardware stores. In order to promote the skills of recording and communicating, students produced posters of their work, (See Appendix B.

War, what is it good for?

The production of the artefact and its use in experimentation involving numeracy and graphicacy, the exploration of the historical context, and the geography of the Mediterranean basin seem appropriate either in their own right and as an integrated unit of work; however, there are other important issues which need to be examined. Essentially, the mangonel is a military device employed in its time as a killing machine, and thus, discussion and exploration is needed to enable the students to reflect on whether such an artefact is appropriate for that reason over above any minor concerns regarding safety. Students can be led into completing a full scheme of work on the mangonel and not reflect on issues to do with war; regardless of the view of teachers, ‘modern’ civilization enjoys the perceived benefits of the technology and science of war.

Throughout history technology has advanced at a faster pace during times of war, for example, air travel, nuclear energy and space travel are all technological developments made during WW2. War in general brought the internal combustion engine to the masses, simply by virtue of the surplus trucks and vans left over from the First World War, and flight was balloon-based in 1914, but by 1918, all sides had fully fledged air forces, which again placed the idea in the minds of those savvy enough to suggest that people could enjoy flying as a pastime or have a role in agriculture or the rescue services. The tendency to assign names of materials to periods of time appears to repeat itself throughout history and the name given is typically that of weapons or high end status symbols. Therefore, in the Bronze Age, the majority of tools were still flint or chert, and those of wealth and high-status sported bronze swords weapons. The reason the Philistines gave the Israelites such grief in the Old Testament was because the Philistines had iron weapons. A similar picture emerges in the Iron Age. The vast majority of moveable items continued to be made of wood, bone, antler and stone, and again the reason the Vikings and later the Normans were so perfidious in their conquests was down to their weaponry and armour; their iron weapons had steel tips and

edges, hundreds of years before the Industrial Revolution.

As part of this research students were asked as a reflective question in their assignments “how they felt about using a war machine in a primary classroom as a learning aid?” and this elicited a range of responses similar to the following:

1. I didn't realize this was a war machine, I thought it was just a toy
2. Weapons are part of history, we look at swords, so why not magonel
3. I would be more reluctant to do this activity since it is a war machine

The need to reflect on the content in terms of origin, policy and significance is therefore, reinforced.

CONCLUSION

In terms of students' overall approval of the work, they rated the work interesting and worthwhile generally, and their attitude in using the theme of Byzantium was positive. In addition, doing the science experiment was seen as a very positive aspect to the scheme since design and make activities tend not to use the artefact for an experiment. However worthwhile, as the activity is, students did in general feel empowered to try this activity at some stage, but not on teaching practice / school placement. Students appeared to be somewhat ambivalent regarding the 'issues' aspect of the work, and rather too accepting of the lead of the lecturer to provide work without critical reflection. Two major issues that were reflected on were 'war' and 'gender' stereotypes. While all students agreed on the destruction caused by of war, they did not see using a “war machine” as a learning tool as problematic. In addition, the issue of gender stereotyping was discussed around the notion that boys are better at using tools such as saws, and the lesson was seen as a useful method to challenge these assumptions.

Therefore the integrated lesson of *Sailing to Byzantium* is a valuable topic that can be used to develop design and make skills, together with the student's ability to reflect on the purpose of past and current technological developments. As one survivor of the Jewish Holocaust, a physicist-cum-science educator put it, “we should not stop science because of war, we should use science to stop war, but we must always, always, reflect on what we do and why we do it”. (anon., pers. comm., 2006). With regard to war and gender stereotyping, it is simply not enough to speak out against such wrongs; but rather, we should always live actively to prevent them.

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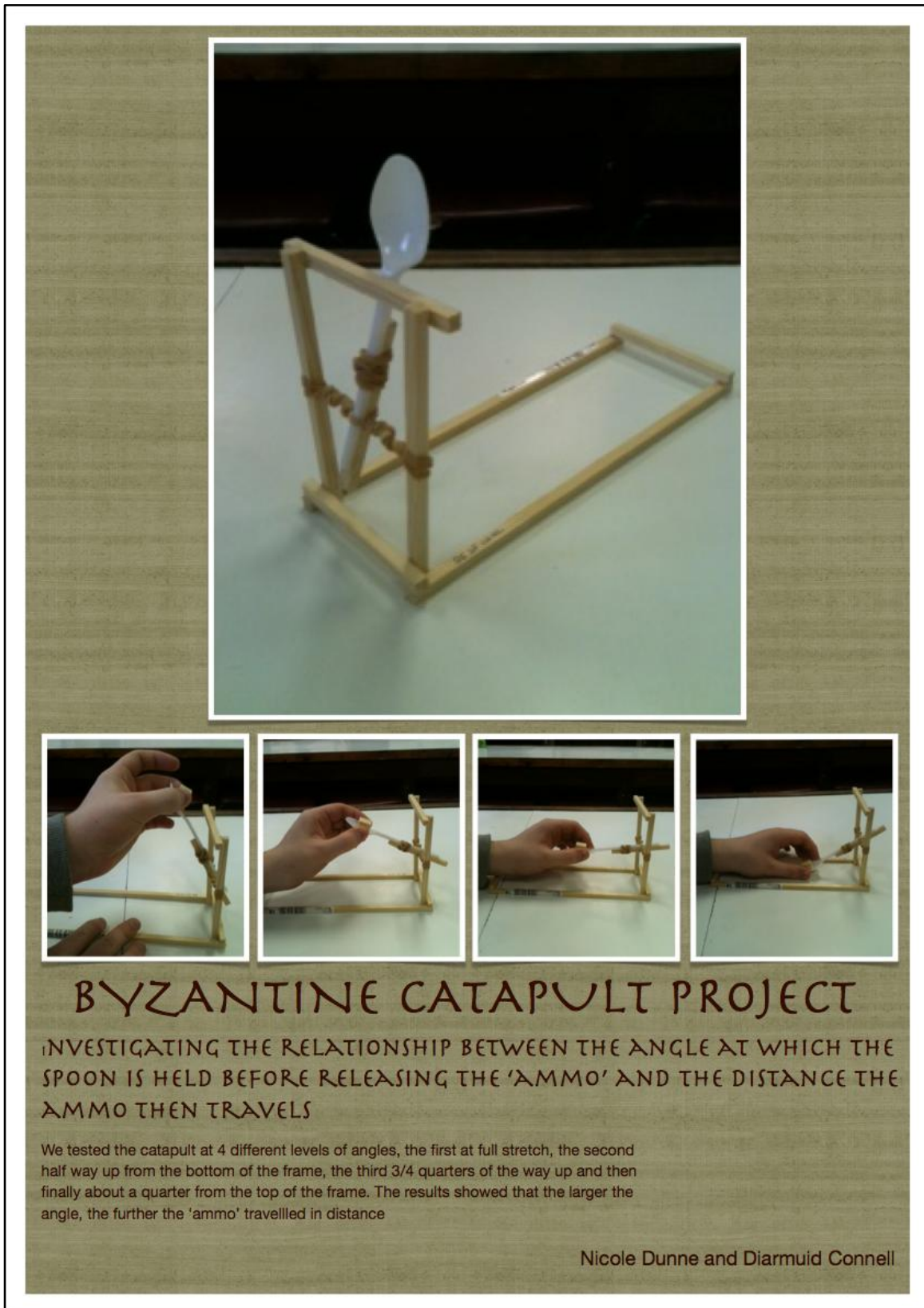
Appendix A. Card of Byzantine Artefacts



**Byzantine
Artefacts 1.**

**4th – 16th
Centuries AD**

Appendix B. Example of a poster produced to illustrate the work done



FROM UNDERSTANDING TOWARD RESPONSIBILITY? PEACE BUILDING EDUCATION ON THE ISLAND OF IRELAND – A CONCEPTUAL FRAMEWORK

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ABSTRACT

Critical examination of the relationship between education and conflict has highlighted that education can serve to support peace, but may contribute towards violence (Bush and Saltarelli, 2000; Davies, 2004). As this field has expanded, a gap between theory and practice has been identified (Novelli and Smith, 2011; Tomlinson and Benefield, 2004). In particular there is an absence of research on educational interventions aimed at building peace (Davies, 2005, 2010; Salamon, 2004). This paper is based upon the preliminary findings of on-going research which seeks to explore how peace-building education is conceived and practiced on the island of Ireland, and how it is experienced and understood by its target audiences. Through a discussion of the emergent themes generated from a series of semi-structured interviews with programme developers and facilitators, this paper provides a preliminary discussion of the rationales which underpin approaches to peace-building cross-border education programmes on the island of Ireland. Furthermore it seeks to provide a discussion of the potential of Davies' (2005) Typology of teaching about conflict as a conceptual framework.

INTRODUCTION

Exploration of the connection between education and armed conflict reveals a complex relationship (Davies, 2004). Education systems and the individuals operating within them have, at times, rallied against the destruction caused by violent conflict, and worked towards a more peaceful future. At other times, individuals, institutions and systems have directly and indirectly contributed towards violence, destruction and human suffering (Bush & Saltarelli, 2000). This paper begins by providing an introduction to the design of peace education programmes, with a particular focus on such initiatives on the island of Ireland. A number of different frameworks have been suggested in order to advance understanding of the contribution of education towards issues of conflict and peace.

¹ This paper is drawn from a larger study which is supported by the Irish Research Council

The paper then provides a critical examination of one such framework, namely Davies' (2005) *Typology of teaching about conflict*. After an explanation of the methodology, a number of emergent themes generated from this period of data collection are discussed. The paper concludes with a contemplation of how the issues uncovered within this study may be developed further.

CONTEXT: PEACE EDUCATION ON THE ISLAND OF IRELAND

As the analysis of education and conflict has developed, research has begun to explore how education may be harnessed to address issues of conflict. Harris (2010) identifies how peace education approaches have often developed based upon the contexts within which they operate, and that the historical impact of acts of violence has often shaped programmes. For example, the destruction caused by nuclear weapons has influenced peace education in a Japanese context, and the teachings of Gandhi underpin many forms of peace education in India. Harris also notes that on a larger scale, peace education in the global south is shaped by the issues of poverty, deficits of human rights, and the search for social justice.

Conflict has occurred throughout much of the history of the island of Ireland, with rebellions, risings, campaigns and wars featuring prominently. Contemporary research exploring the relationship between education and conflict has often examined the case of more recent violent conflict in Northern Ireland. 'The Troubles' involved a loyalist/unionist population who wished for Northern Ireland to remain as part of Britain, and a nationalist population who wished for Northern Ireland to re-join the Republic, as part of a united Ireland (Cairns and Darby, 1998). This division was further delineated along lines of religion, expanding the identifiers of opposing sides to loyalist/unionist/protestant and nationalist/catholic. As the relationship with the Republic of Ireland was a cleavage along which the conflict developed, it is unsurprising that the peace agreement of 1998 involved both jurisdictions. The resultant peace process considered not only the relationships between groups in Northern Ireland, but also the relationships between the Republic of Ireland, Northern Ireland and Britain as a whole. Indeed, the development of North-South educational links on the island of Ireland was considered a potential area of development between the two regions (Northern Ireland Peace Agreement, 1998). Pollak (2005) identifies that the renewal of educational links between the jurisdictions began in the two decades before the peace agreement, with both governments and the European Union seeking to address the conflict within Northern Ireland but also promoting a European identity. Supported by funding from both sides of the border, the first North-South educational programmes, the European Studies Project (ESP), sprang from the

Anglo-Irish agreement of 1985, with a number of further projects appearing both before and after the Good Friday/Belfast agreement.

Northern Ireland is currently experiencing a fragile peace, but deep societal divisions remain (McCully, 2006). This post-conflict status has implications for how Northern Ireland and the programmes operating within its borders are viewed.

Salomon (2002) categorises peace education approaches in relation to the socio-political environment within which they are located:

- Peace education in intractable regions
- Peace education in regions with interethnic tensions
- Peace education in regions experiencing tranquillity

Northern Ireland's position within this framework is uncertain. Furthermore, the status of the Republic of Ireland, and therefore peace education initiatives which transcend the border, are also not easily categorised. As such, cross-border peace education initiatives provide an opportunity to consider the limits of such definitions of peace education programmes and the contexts within which they occur.

Salomon (2004) identifies the objectives of peace education programmes as addressing attitudes, decreasing prejudice and developing shared identity. Such aims appear focused on the interpersonal aspects of learning which fit with Davies' (2004) proposal that successful peace education should be based around the 3Es, namely exposure, encounter and experience. Importantly, Davies also notes that this framework could be extended to critical engagement through approaches which support dialogue, creativity and agency. More recently, Smith and Ellison (2012) provide a framework which categorises peace-building approaches within schools. On the one hand, conflict management approaches are identified. These involve the development of methods such as intergroup contact and bridge building activities, which develop civic knowledge. On the other hand, Smith and Ellison offer a hugely important extension to previous frameworks by identifying peace building programmes which consider inequality and power through fostering political literacy and engagement.

A TYPOLOGY OF TEACHING ABOUT CONFLICT

In pursuit of a framework which conceptualises the relationship between education and conflict, Davies (2005) developed a typology of *Approaches to teaching about conflict* as illustrated below.

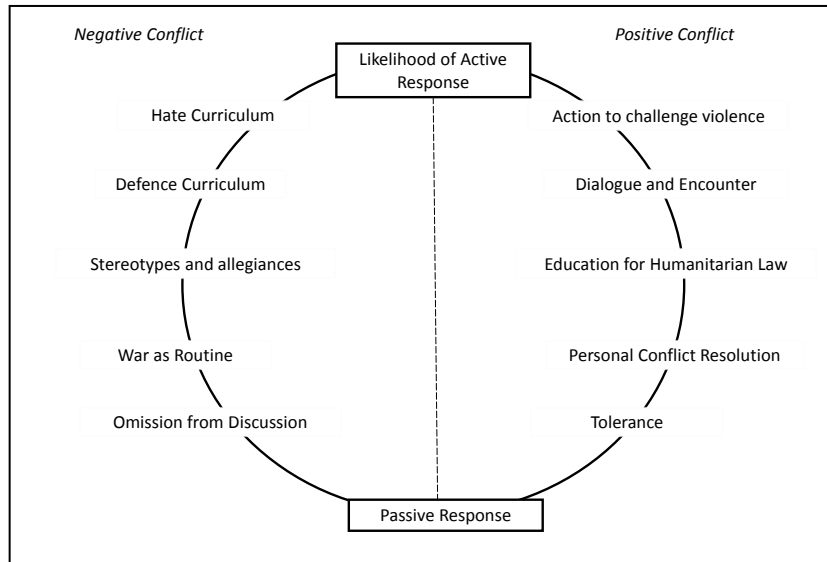


Figure 1: Approaches to teaching about conflict (Davies, 2005)

This framework categorises approaches that contribute towards either negative conflict or positive conflict, which will be explored shortly. These approaches are also situated on a continuum between modes which may lead to a passive response, through affecting the knowledge and understanding of learners, and at the other extreme leading to active responses where learners may take action. This paper will now give a brief explanation of each of the proposed modes of teaching about conflict that fall within the negative conflict dimension, which may lead to violence, before exploring the positive conflict dimension, with a focus on two particular approaches.

Education for Negative Conflict

The curriculum prioritises particular forms of knowledge, and whilst certain knowledge is promoted, other knowledge is delegitimised (Apple, 2000; Bickmore, 2006). Recent research has begun to explore how the curriculum frames conflict-related learning in schools (Tawil & Harley, 2004). Davies (2005) identifies the ‘curriculum of hate’ where the enemy is denigrated and the cleavages along which violent conflicts are based are widened.

Davies also identifies the ‘curriculum of defence’, where the militarisation of young people through the formal education curriculum prepares them for involvement in violent conflict.

Still within the negative conflict dimension, but towards passivity, are approaches which, through stereotypical images, reinforce the perceptions and allegiances which can or have led to violent conflict. In certain situations, the continuous nature of violent conflict may come to be seen as a norm, which Davies (2005) identifies as ‘war as routine’. For the final mode, Davies draws on the concept “violence by omission” (Salmi, 2006) in identifying approaches which contribute to negative conflict by exclusion.

Education for positive conflict

Positive conflict is defined as approaches to teaching which provide learners with the opportunity to enter into “argument, dissent and debate” (Davies, 2011, p.1). ‘Tolerance’, ‘conflict resolution’ and ‘education for humanitarian law’ are found on the positive conflict dimension and form a lengthy component of the broader study; however this paper focuses on the two teaching approaches suggested as methods which may produce an active response from learners, namely ‘dialogue and encounter’ and ‘active challenge to violence’.

Dialogue and Encounter

Smith (2011) identifies that, to mixed reaction, cross community programmes aimed at developing intergroup contact in Northern Ireland have received in the region of £1million per year from the UK government. As a theoretical grounding for such approaches, *contact theory* has underpinned much work between oppositional groups in Northern Ireland (Cairns & Hewstone, 2002), and has been utilised as a tool to challenge the issues attached to social identity which have fuelled the conflict. Research involving the use of contact theory in Northern Ireland has been centred on the relationships between individuals from opposing groups potentially contributing to the reduction of conflict (Allport, 1954). Niens & Cairns (2005) summarise the educational response to intergroup relationships in Northern Ireland, reviewing research which considers the effect of such approaches on young people, and identifying the importance of sustained and effective educational interventions. As Gallagher (2011) also identifies, collaborative programmes require maintenance and as such, the commitment towards these educational approaches requires examination.

Active challenge to violence

As a conflict which led to over 3,500 deaths and affected many people both in Northern Ireland and across the border, it is unsurprising that this particular conflict features heavily in any contemporary discussion of violent conflict on the island of Ireland. Davies (2005) argues for a more holistic approach to peace education, based upon “not just conflict resolution but political learning about issues such as the arms trade, and encouragement to take an active part in campaigns” (p.27). Other examples of other relationships with armed conflict might also include: the militarisation of the economy and the effect on the education system; involvement in multilateral organisations (such as United Nations peacekeeping forces); troop involvement in conflicts beyond national borders; economic trade restrictions; support or allegiances for particular groups within armed conflicts. Salomon and Cairns (2010) identify that, despite an acceptance that both political and psychological factors can produce conditions which heighten the risk of conflict, it is upon the psychological issues of prejudice and hostility that the majority of peace education programmes focus. Teaching approaches which address political issues, and develop the skills and attitudes which support learners in challenging violence and injustice have not received attention. Indeed, “research is still needed to provide more examples of students engaging in such positive dissent” (Davies, 2011, p.1).

METHODOLOGY

This paper is based on some of the emergent themes garnered from a series of fifteen semi-structured interviews with individuals who have been involved in the design, development and facilitation of cross-border peace education programmes on the island of Ireland. These interviews were between 1 and 2 hours in length, and were audio recorded. Each interview was then transcribed verbatim before being analysed for emergent themes based upon participants’ experiences and perceptions of peace education initiatives. The initial themes were derived from interview data which considered general peace education programme content in relation to the conceptual framework of *Typology of teaching about conflict* (Davies, 2005). This data is drawn from a larger study which combines document analysis of curricular materials, peace education programme observations and focus groups with young people involved in cross-border peace education initiatives.

EMERGENT THEMES

From the personal to the global

The global outlook of peace education was superseded in the 1980s by forms which offered a domestic version of peace education, often linked to conflict resolution, and justified due to the presence of violence in communities (Harris, 2010). Davies (2010) suggests learning about conflict at an interpersonal level, or, at the other extreme, regarding conflicts that occur in distant locations, provides a learning experience which may prove too far situated from the conflict involving young people's own countries. The majority of participants discussed how peace education projects included aspects of interpersonal conflict as well as making reference to conflicts in other parts of the globe (such as Israel-Palestine, Afghanistan, Iraq) and at other points in history (Germany in the second World War). However, there did appear to be a gap between the personal and the global, with national issues related to conflict absent from initial discussions. The concept of teaching through the use of a "gradient of controversy" which explores conflict in contexts removed from home, before dealing with emotionally charged controversial issues has been suggested (McCully, 2006), and will be explored in greater depth in the larger study.

Contact theory: possibilities and limitations

"It's like that Contact Theory, that just by being in contact with other people, it would make a difference." (Interview with Participant B)

Contact theory was explicitly referenced as a theoretical basis for a number of cross-border peace education initiatives that have taken place. The cross-community work in Northern Ireland based on contact theory was referenced as an example of good practice by many of the practitioners. In these cases, the contact theory was viewed as an approach which could be built up strategically over a period of time, and was seen very much as a process. Some participants were sceptical of the potential of contact theory, with reservations around "one-off" events which "throw children together". There were a number of mentions of cross-border programmes which "linked" schools in Northern Ireland with schools in the Republic of Ireland, and participants questioned how processes (and their associated definitions) which took place within Northern Ireland (such as reconciliation) were applicable to cross-border programmes.

Whose peace is this anyway?

“I suppose I would have felt like that about a lot of the peacebuilding work. As a young person involved in the peacebuilding...it was done to you...instead of a process that you are part of.” (Interview with Participant J)

One particular theme which has emerged from the initial stages of data collection is the position, voice and agency of young people within the peace process. A number of participants suggested that the operation of peace education programmes with the formal education system limited the extent to which young people were able to gain ownership over the process. Questions around the agency (Machel, 2001) and position (Smith and Ellison, 2012) of young people emerged during the review of literature and as such, prioritising the perceptions, experiences and understandings of young people is at the centre of the broader study. With regard to the conceptual framework, Davies (2005) herself bemoans the limitations of a lack of focus on learner response within the framework and questions the attitudes toward the input of young people when deliberations on the impact of educational policy and practice in this area are made. It is therefore vital to ensure that young people's voices illuminate this research, into not only the longer term impact of teaching about war and conflict, but of global citizenship education in general (Davies, Harber & Yamashita, 2005).

CONCLUSION

This paper has provided an introductory examination of the island of Ireland as a context for peace education, with a particular focus on cross-border educational initiatives. A number of frameworks seek to provide a clearer understanding of the relationship between education and conflict, and share many similarities. The typology of teaching about conflict (Davies, 2005) illustrates the converse potential of education as a force for both negative and positive conflict, but also allows for a deeper consideration of the extent to which teaching approaches support either active or passive approaches to issues of conflict. Furthermore, the framework provides the opportunity to consider approaches which support learners in actively challenging violence, an aspect which has so far received very little coverage within academic literature. Finally, the paper has provided a discussion of some of the emergent themes gathered from a series of in depth interviews with educators who had been involved in the design and delivery of cross-border peace education programmes, namely the global dimension of conflict, the possibilities and limitations of contact theory, and the position of young people within processes of peace. These themes will be developed and strengthened as further data is collected and the broader project moves on.

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The Preliminary Findings of the Science Coteaching in Teacher Education (SCITE Project): The student teachers' perspective

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ABSTRACT

This paper reports on the preliminary findings of the Science Coteaching In Science Education (SCITE) Project which is funded by the AstraZeneca Science Teaching Trust. The project sought evidence that coteaching is an effective method for developing the practice of undergraduate student teachers and in-service teachers and provided a context to evaluate a theoretical framework devised to describe coteaching. During the project ten pairs of student and in-service teachers coplanned, cotaught and engaged in coreflection throughout a series of seven primary science lessons based on innovative approaches modelled during a series of workshops. Both teaching partners then continued to adopt these approaches during their solo teaching later in the year. This account focuses solely on the experience of the undergraduate student teachers. Data obtained from questionnaires, semi-structured interviews, and lesson evaluations indicate that the students felt they were now much more competent and confident in all aspects of their practice and that their solo practice had been greatly developed. Our preliminary evaluation of the enhanced learning opportunities which the students felt were provided by coplanning, coteaching and copractice are consistent with the proposed theoretical framework.

INTRODUCTION

This paper reports on the preliminary findings of the Science Coteaching in Science Education (SCITE) Project. The project, funded by the AstraZeneca Science Teaching Trust, sought to identify the particular advantages of using coteaching as a methodology for simultaneously developing the practice of in-service teachers and undergraduate student teachers and examined how closely the emergent data supports a theoretical framework recently proposed to describe coteaching. This account focuses solely on the affordances provided by coteaching from the student teachers' perspective and considers how this informs our practice within initial teacher education (ITE). Coteaching as a methodology is particularly relevant to initial teacher education in Northern Ireland given the reported decrease in the amount of primary science being taught in schools since the revision of the curriculum in 2007 (Johnston, 2013). If there is less science being in taught primary classrooms then our students will have less opportunity to either teach or observe science during their school placements.

A THEORETICAL FRAMEWORK FOR COTEACHING

Coteaching can be described as teachers sharing the responsibility for all aspects of practice, such as planning, teaching, assessing and evaluating (Martin, 2009).

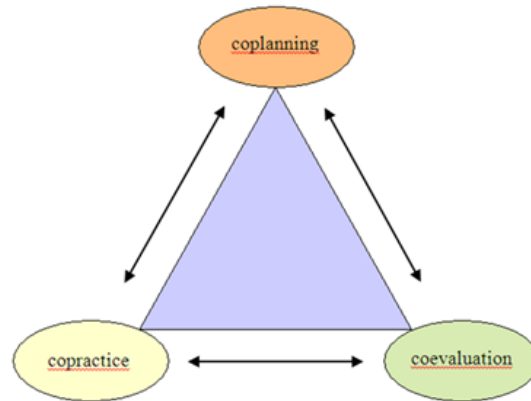


Figure 1. Phases of coteaching

It can provide a range of benefits such as decreasing student teachers' anxiety in the classroom, developing the quality of teachers' reflective practice, allowing for more pupil-centred enquiry-based learning, improving teachers' skills and pedagogical competences, and importantly enriching the learning experience of pupils.

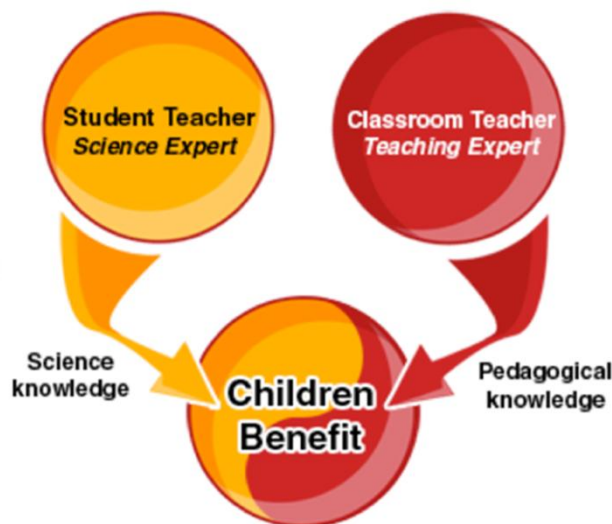


Figure 2: How coteaching enriches pupil learning

The key characteristic underpinning coteaching is that pre-service teachers engage in discussions about practice and praxis with their cooperating teaching partners. Unlike more traditional practices for initial teacher education coteaching assumes that both partners are

responsible for pupil learning. In-service teachers continue to address the needs of their pupils whilst engaging in formal reflection about their practice as they discuss planning, pupil learning and behaviours with their partner student teacher. At the same time the student teacher finds themselves immersed in a rich learning culture of collaboration and discussion as the benefits of reflective practice are uncovered. Studies (Gallo-Fox, 2010; O’Conail, 2010) have shown that coteaching provides student teachers with the confidence to extend their teaching repertoires and their desire to adopt innovative approaches. It has also been reported to close the perceived gap between theory and practice within initial education programmes (Roth et al., 1999). Despite the apparent advantages of coteaching there has been little progress in devising a theoretical model for coteaching which can meaningful answer questions about *how* and *why* coteaching ‘works’, thereby providing a set of tools for the design and development of coteaching in pre-service programs. Whilst a comprehensive critique of the proposed model (Murphy, Scantlebury and Milne, under review) will be the subject of subsequent publications we feel a brief description of this theoretical framework is required to contextualise the data relating to our student teachers’ experience.

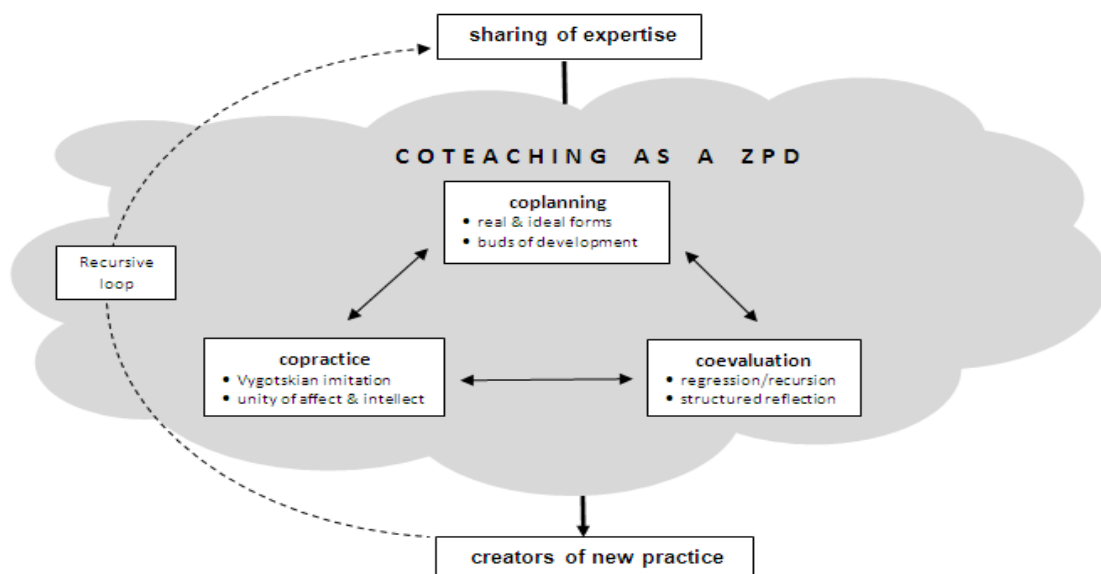


Figure 3. Conceptual framework for coteaching in science teacher professional development (shaded area represents the ZPD)

Coteaching creates the ideal conditions for learning by providing a zone of proximal development (ZPD) in which the collective achieves more than the individual. Within the ZPD development takes place as a result of interaction, principally via language which serves as a cultural tool for activating higher psychological functions. Over time the ZPD comprises the changes that need to occur for the learner to move along a learning trajectory from mutually assisted coplanning, copractice and coevaluation to self-assistance as a creator of

new and ultimately ideal practice. The sharing of experience and mutual respect attend to the emotional aspects of learning and sustain both learners through cycles of regression and recursion.

PROJECT DETAILS

The project formed the context for an optional primary science education module within the third and fourth year of a B.Ed programme and involved ten students partnered with ten teachers from six local primary schools. There were three distinct phases of activity; planning and preparation; copractice; and solo practice.

Planning and preparation

During this phase the teacher-student teacher pairs attended workshops on a range of innovative approaches including: using stories, puppets, thinking skills, digital resources and role-play. In addition the participants explored coplanning, coteaching and coreflection and designed a method for recording and data collection. As researchers we adopted a constructivist stance with regard to the design and use of the research instruments and data collection methods. Our coteachers helped design the formats for the coplanning and coevaluation templates and chose to use video to record their experiences. We considered the participants to be as much the subjects of the research as well as the objects.

Copractice and solo practice

A total of seven science lessons were coplanned, cotaught and coevaluated during semester 1. The topics and content were chosen by each coteaching pair. A dissemination seminar was held early in semester 2 to allow coteachers to share their coteaching experiences and exchange ideas therefore extending out students' and teachers' repertoires of engaging science lessons in preparation for the final stage of the project, their solo practice. During the course of our student teachers' school based placement we required that they put into practice the pedagogical approaches which they had developed during the copractice phase. Our participating teachers were also required to try to incorporate into their own solo practice some of the innovative forms of pedagogy used during coteaching. Both parties were required to record their reflections and evaluations. The project concluded with a celebration and dissemination event during which the teachers and student teachers described how their practice had developed through the course of the project.

Research Methods

As stated previously, researchers and participants constructed all data collection methods collaboratively. Questionnaires were used at the start of the project, to identify a baseline regarding participants' practice and perceptions of good practice, and then repeated at the end of the project. Semi-structured interviews were held at the end of the project. Documents such as coplans, coevaluations, classroom observations, students' assignment essay 'How coteaching has developed my reflective practice' and video recordings, also provided rich sources of data.

Results and discussion

This paper reports on the impact of coteaching on the development of our student teachers. Each student completed a self-assessment of their practice with regard to each of the General Teaching Council for Northern Ireland (GTCNI, 2007) competences. We decided to use the competence statements used to assess students during their school based placements. The number of students who reported an increase in their competence for each competence statement is shown in Figure 4. The results show that students developed in all of the identified teacher competences. The competences in which the greatest number of students improved were: setting appropriate learning outcomes; monitoring learner progress and critical reflection. This suggests that coteaching can inform practice throughout the whole cycle of a teacher's practice; planning, teaching and reflecting.

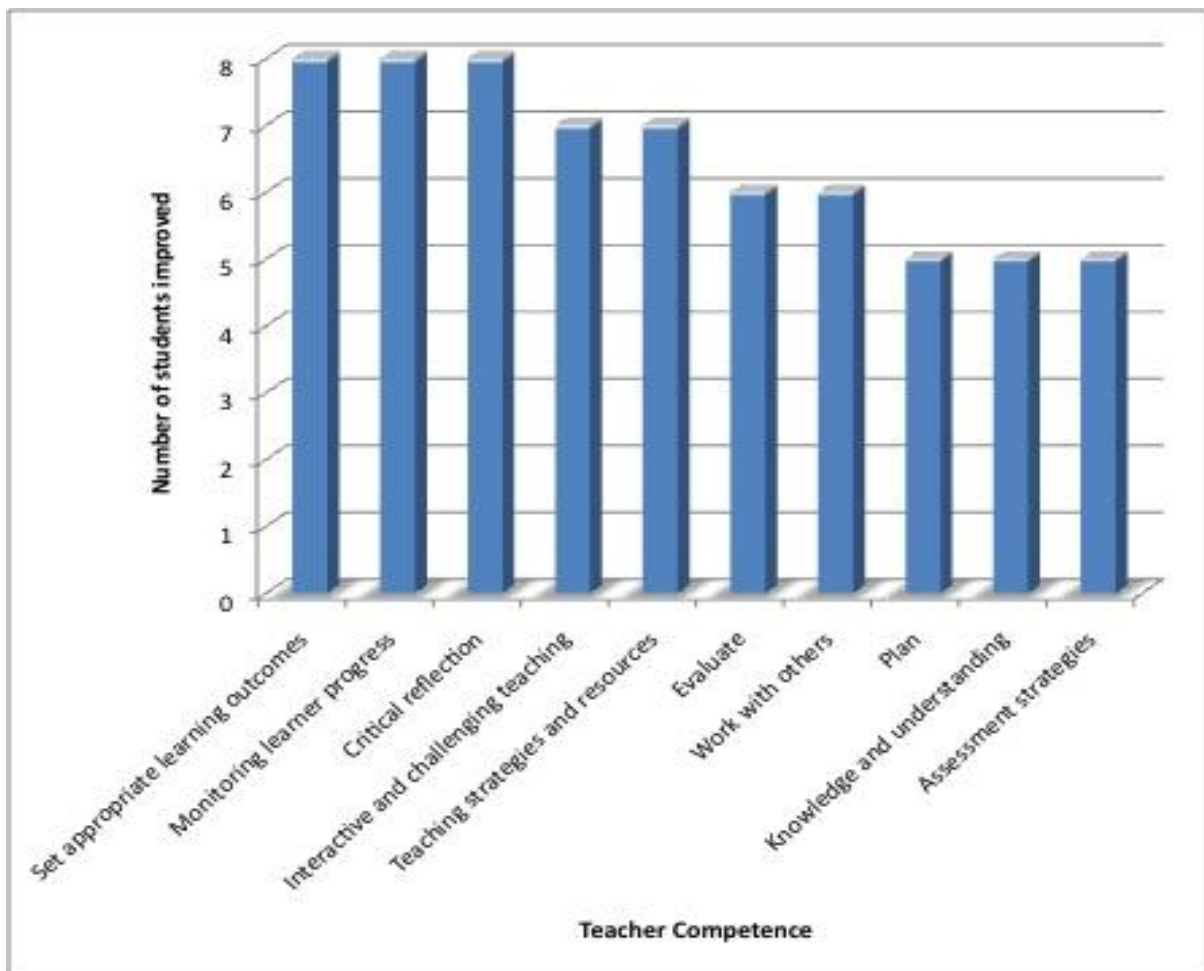


Figure 4. The number of students (n=10) reporting an increase in each of the competences

The number of competences in which each of our student teachers developed is shown in Figure 5. The profile shows that the learning experience and therefore learning needs of each student is different. The data shows that eight of our ten students improved in at least half of the teacher competences. We will now further explore the findings around these three themes of planning, teaching and reflecting.

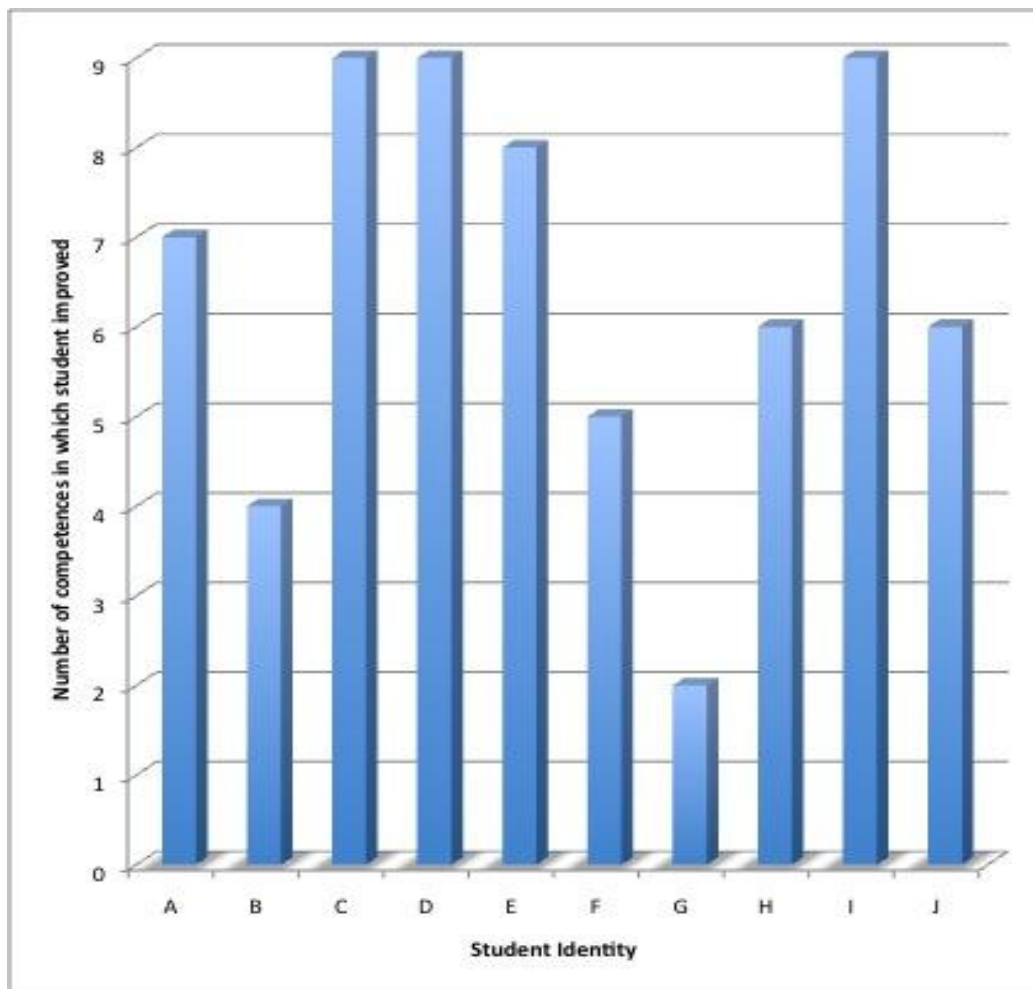


Figure 5. The number of competences in which each student reported an increase.

Planning- ‘Setting appropriate learning intentions’

A number of students reported how coteaching had enhanced their planning skills by making them more selective about what they plan and how it supports pupil learning. Thinking around planning has changed from ‘planning for teaching’ to ‘planning for learning’.

Students also felt that their thinking ‘*was more grounded*’ and that coplanning had helped them become ‘*less likely to get carried away and try to include too much in a single lesson.*’

Students generally described how they felt more confident in their planning and would in future be more proactive regarding trying out new approaches. The following quotes illustrate how coteaching brought about this development.

Even from my first lesson compared to the last one in coteaching I felt so much more confident from learning from the class teacher, and then just organisation and introducing topics before the practical aspect – I was more confident in knowing to plan the learning.”

“Less is more- before I thought I have to cram every piece of science into this one lesson but no you don’t have to do that- you can focus on one part- that for me broke it down better.”

“I think you always thought science had to be practical and child-led but in practice you were too scared to let children take the lead- it was easier just to tell them what to do, but here children came up with ideas and we just had to run with them.”

Teaching – ‘Monitoring Learner Progress’

Students’ classroom practice was greatly enhanced by working ‘at the elbow’ of an experienced practitioner with a considerable insight into their pupils’ behaviours and abilities. This resulted in an increase in provision for hands-on practical work, no longer ‘scary’ or ‘potentially problematic’, thereby enabling the students to see first hand the pedagogical advantages of this approach. One student described how ‘*the teacher knew her class so I could see how she organised them and could anticipate any off task behaviour before it happened; I learned a great deal from being directly involved in this.*’ The following quotes develop this theme.

“Coteaching made me feel good because children were learning and you could see the progression in learning every week and every week they looked forward to you coming in.”

“Children who shouldn’t have been able to explain science concepts were able to give a clear, concise explanation, they knew what they were doing and they could replicate an experiment if you asked them to.”

A number of students described how they felt the quality of their classroom dialogue had been improved, particularly their use of questions and their confidence to ‘*keep going with pupil responses and build on their ideas and previous knowledge*’. The challenging task of assessing pupils’ progress was also noted as an area which had been developed by making use of digital resources.

“You became more confident in how you would assess when you weren’t relying on a worksheet- taking photographs and recording children meant you still have your evidence- it’s just how you collect it and record it- it was so valuable.”

“Using videos gave value to the children’s talk in science and for the children who had poor written literacy skills it was good for them to sit in front of the camera and talk about their learning- it gave them a lot of confidence.”

Reflecting: Critical Reflection

From the information gathered in the interviews and within the students' written assignments it was very clear that the both students' perceptions and practice regarding reflection had been powerfully transformed. All our students now considered reflection to be meaningful and worthwhile as opposed to '*something we have to do during school based work*' where it was suggested '*we always end up writing the same kind of stuff to keep the tutor happy.*' We feel that changing our students' disposition to reflection is as important as developing their skill at it. The following quotes show evidence of the longer term benefits of this coteaching experience and the transformation of focus from teaching to learning.

"I found myself thinking 'What would [Teacher] say?'"

"I now know how to use my reflections to inform my practice"

"If you had coteaching without coreflection it wouldn't be worth anything."

"The content of reflection changed- before I focussed on resources and how they worked whereas after coteaching I went 'okay this group didn't get this and this is why I think they didn't get it, so this is what I'll do instead next time'. It was much more detailed in terms of children's learning instead of the practical setup of the classroom."

Ideal Practice

Coteaching provided the opportunity for our students to adopt teaching strategies and forms of pedagogy which they would have been less likely to engage with during their school based teaching placement as a result of fears regarding assessment of their practice, thereby more likely to '*keep the science teaching safe.*' The learning resulting from directly witnessing the benefits to pupils of this more 'ideal' form of practice would appear to have been very powerful and considerably informed the students' future teaching.

"I could really see how important it was to get the children to predict and how to go about helping them do this if they were afraid to be wrong."

"I suddenly could see what is meant by children taking ownership of their learning. Because the group of boys decided what they wanted to test they were really in to it."

CONCLUSION

We feel this data describing the student teachers' experiences makes a strong case for including coteaching within initial teacher education programmes. We propose that the ZPD which coteaching provides facilitates meaningful thinking coupled with purposeful activity in

the areas of planning, teaching and reflecting. Coteaching attends to several of the 'principles to guide development of responsive teacher education programmes that make a difference' as identified by Korthagen et al (2006: 1036), namely; viewing knowledge as a subject to be created; facilitate student teacher research; prioritise peer working; and nurture meaningful relationships between schools, universities and student teachers. In the words of one of our coteaching student teachers, 'all student teachers should have a coteaching experience.'

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Using Digital Teaching and Learning Tools with Pre-service Teachers for Primary Science Classrooms

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ABSTRACT

The Irish Government's Strategy for Science, Technology and Innovation 2006-2013 states that 'if we aspire to build a sustainable knowledge economy and become world leaders in STI we must build strong foundations in primary and second level education and our system needs to develop to make this happen (Government of Ireland, 2006). Therefore Initial Teacher Education (ITE) programmes must not only provide the opportunities for students to develop a strong pedagogical content knowledge (PCK) but also a strong matter knowledge (SMK) in science by strengthening their conceptual understanding and investigatory skills in science to enable them to teach science concepts in a meaningful manner.

In ITE, one must also consider that our world is changing with an increase in the amount and variety of different digital teaching tools readily available to all. The National Strategy for Higher Education to 2030 stated that 'in the coming decades, the delivery of higher education in Ireland must be characterised by flexibility and innovation' (DES, 2011). This project is answering the calls from both the Government and DES. The research involves the use of a variety of innovative digital teaching and learning tools in Science Education Modules for pre-service primary teachers with the aim of enhancing the teaching and learning of science and strengthening their SMK, PCK and Technological Pedagogical Content Knowledge (TPACK) for the modern world. TPACK is emerging as an important area for research and development. TPACK involves integrating knowledge about the affordances of technology with pedagogical and content knowledge.

INTRODUCTION

The 21st Century has been characterised by the introduction of a wide range of modern technologies, with a vast selection of communication technologies to choose from and thus leading to the acceleration in the use of ICT in education (OECD, 2001; 2005). With an increase in the amount and use of new technologies, for example hardware and software such as computers, lap tops and other mobile devices (smart phones, I Pads), Interactive White Boards, educational games, simulations, software applications and the Internet, education must adapt and keep up to date with this evolution in order to be able to incorporate such computer based technologies into teaching and learning methodologies. This can be a very difficult and daunting task as 'we (teachers) are the immigrants to the information age' (Galvin, 2000). Integration of ICT requires training and support for teachers, innovation, change in teaching and learning strategies and time (BECTA, 2006; Ofsted, 2004).

TECHNOLOGY IN EDUCATION

In the past several decades there has been a considerable level of investment from governments with the aim of improving the amount of technology available, resulting in an increase in the access to and the use of ICT in primary schools across Europe (BECTA, 2006; DfES, 2005; EACEA, 2007; DES, 2001; NCTE, 2004). As a result the level of ICT provision is continuously improving in schools, with an increase in the use of ICT by teachers. As a result of 'Schools IT 2000', a policy framework from the Department of Education and Skills (DES), the use of ICT has grown exponentially in both primary and secondary schools around Ireland (DES, 1998). This policy succeeded in raising the profile of ICT in Irish Primary schools by investing significantly in providing increased resources in schools, training in education centres and online support on ScoilNet (the official education portal of the Department of Education and Skills in Ireland with access to curriculum focused resources and support for primary teachers).

It is important to note, while governments have invested significantly right across Europe on technology for the classroom, this itself is not enough to ensure that teaching has automatically improved (DiSessa, 2001). Research has shown that ICT integration into subjects, teaching and classrooms is the key to changing teaching practices (EACEA, 2007). The Report of the Task Force and Engineers Ireland on Mathematics and Science Education stated that the use of ICT needs to be significantly improved to assist and support Science Curricula, to aid in the visualisation and understanding of the most abstract concepts (Task Force on Education of Mathematics and Science, 2010). The 'Impact of Technology in Primary Schools (STEPS)' study which carried out a survey of Ministries of Education, found that National ICT Policies across Europe usually aimed at improving infrastructure and teachers' digital competence but were less frequently focused on pedagogical reform and leadership (EACEA, 2007). The DES in Ireland has acknowledged the importance of providing the tools, knowledge, infrastructure, but also support, resources and curriculum-relevant digital content to transform schools into e-learning environments (DES, 2008). This is evident from the findings of the European Schoolnet survey where teachers' confidence in Ireland in their operational skills with ICT were higher than the EU mean. Moreover, Ireland is considerably above the EU average in relation to the number of students in schools where teachers have spent between 1 to 3 days on ICT professional development, although the opposite is the case in relation to more extended CPD experiences (European Schoolnet, 2012, p. 17).

The NCCA has identified that professional development of teachers in the area of ICT integration is a key priority (NCCA, 2004), with the DES investing €337 million over a five year period, €17.7 million of this has been allocated to continuous profession development on the integration of ICT (DES, 2008). However, past studies have highlighted that there can be an over-emphasis on the technical aspect of ICT rather than the practical element of ICT use in the classroom in many of the courses being offered to teachers (Cox *et al.*, 1999).

Educational research in the past has focused on the technology and not on how it is used (Mishra and Koehler 2006). Simply introducing technology to the educational process is not enough, the main focus should be on how the technology is used (Carr *et al.*, 1998; Mishra and Koehler, 2003) i.e. what teaching and learning strategies are evolving and what models or frameworks operate best for effective technological integration (Crompton and Mann, 1996; Hargreaves and Fullan, 1998).

PRE-SERVICE TEACHERS

Colleges of Initial Teacher Education (ITE) need to ensure that all newly qualified teachers enter the teaching profession with the ICT knowledge and skills to be able to teach effectively incorporating ICT into their teaching and learning strategies (NPADC, 2001; Lim, Chai, & Churchill, 2010). The Teaching Council's Policy on 'Initial Teacher Education: Criteria and Guidelines for Programme Providers' sets out a list of learning outcomes for graduates of ITE programmes in Ireland, stating that graduates should be able to use technology effectively, including multi-media resources, to aid pupil learning (The Teaching Council, 2011). While pre-service teachers today are more skilled ICT users than their predecessors (Richards, 2004; Albion, 2003) it is often incorrectly assumed that they have developed sufficient skills outside their teacher education courses. European priorities for improving teacher quality and teacher education, state there is a need to improve teacher competencies in the use of ICT, linking knowledge and information about ICT to curriculum delivery (BECTA, 2006). Many studies in the past have highlighted that teacher education needs to diversify and all ITE programmes need to place a greater emphasis on the pedagogy of technology rather than focusing on the technical aspects of technology (EACEA, 2007; Pelgrum and Plomp, 1993). Teachers need to understand the potential of ICT, how to integrate ICT into their classroom teaching and be taught how to revise their pedagogical practices (NPADC, 2001).

However there are several key challenges currently confronting pre-service primary science education in Ireland: pre-service primary teachers' background and knowledge in science; pre-service primary teacher' confidence in teaching science and; linking Subject Matter Knowledge (SMK) and Pedagogical Content Knowledge (PCK) (Liston 2010, 2011; 2012; Murphy and Smith 2012; Waldron *et al.* 2009).

SUBJECT MATTER KNOWLEDGE (SMK) AND PEDAGOGICAL CONTENT KNOWLEDGE (PCK)

Science education programmes in ITE need to directly link SMK (Subject Matter Knowledge), Pedagogical Knowledge (PK) and Contextual Knowledge (CK). It should allow students develop an understanding of scientific ideas and concepts and translate this into effective pedagogy. The teaching council has stated that there needs to be 'time devoted to lectures, tutorials to facilitate and promote **subject content knowledge; subject pedagogical knowledge; pedagogy**; literacy and numeracy in general and as appropriate to the curriculum/syllabus; reflective practice; the use of **ICT in teaching and learning**; research and independent study, all of which are important components of student teachers' developing professional skills' (emphasis added) (The Teaching Council, 2011, p. 15).

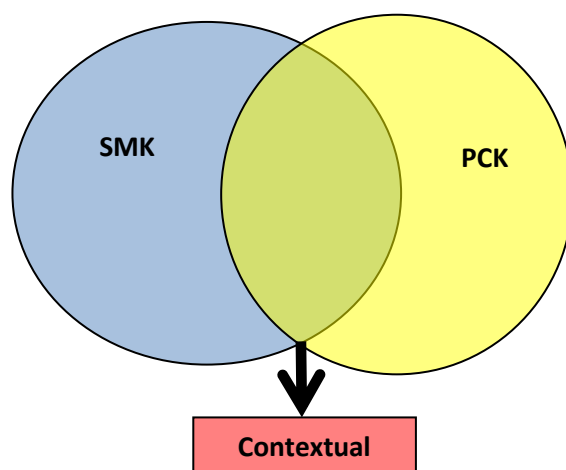


Figure 1: Linking SMK (Subject Matter Knowledge) and Pedagogical Knowledge (PCK) and Contextual Knowledge (CK) in ITE Programmes.

SUBJECT MATTER KNOWLEDGE (SMK) AND PEDAGOGICAL CONTENT KNOWLEDGE (PCK) AND TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPACK)

The increased use of ICT and new technologies, have changed the nature of the classroom (Mishra and Koehler, 2006). Shulman described PCK, as analogies, illustrations, examples, explanations and demonstrations and ‘the ways of representing and formulating subject to make it more accessible and comprehensible (Shulman, 1986). Therefore technologies play a critical role in each of these aspects. Ranging from drawings on a blackboard or interactive multimedia simulations, technologies have afforded a range of representations, analogies, examples, explanations, and demonstrations that can help make subject matter more accessible to the learner (Mishra and Koehler, 2006).

Knowledge of technology is often considered to be separate from knowledge of pedagogy and content. Technological pedagogical content knowledge (TPACK), formerly known as TPCK, is emerging as an important area for research and development (Angeli & Valanides, 2005; Lundeberg, Bergland, Klyczek, & Hoffman, 2003; Mishra & Koehler, 2006; Niess, 2005). TPACK is the integration of the development of knowledge of subject matter with the development of technology and of knowledge of teaching and learning (technological knowledge, pedagogical knowledge and content knowledge and it is this integration of the different domains that supports teachers in teaching their subject matter with technology. Therefore TPACK involves integrating knowledge about the affordances of technology with pedagogical and content knowledge. Effective use of ICT requires teachers to co-ordinate the interaction of these three aspects (Hewitt, 2008; Wright, 2010).

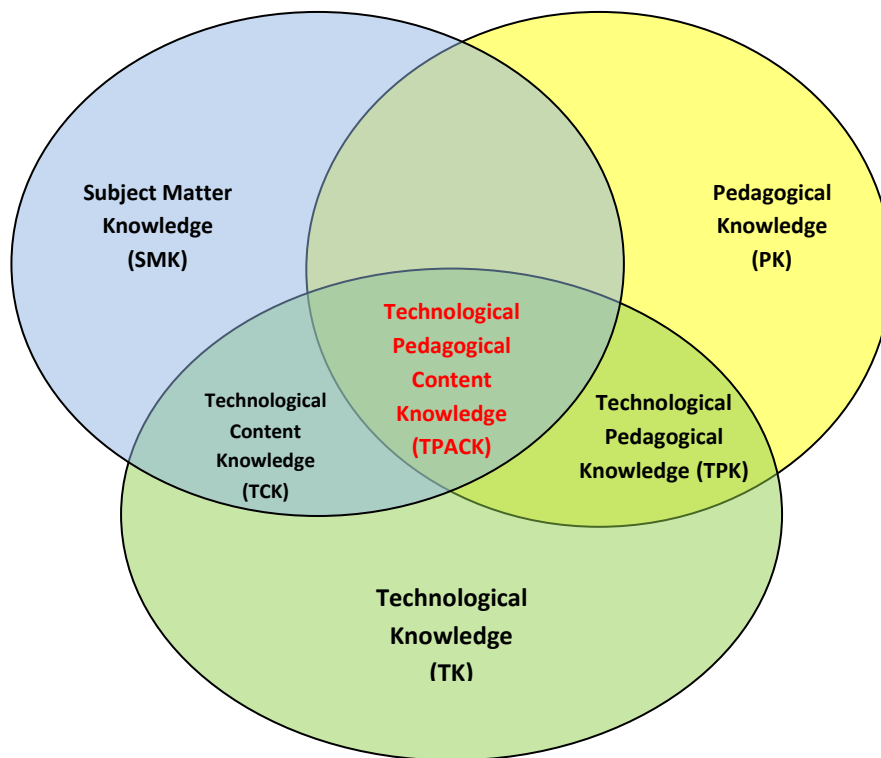


Figure 2: A graphic representation of Technological Pedagogical Content Knowledge (TPACK) (Adapted from Mishra and Koehler, 2006).

Mishra and Koehler’s framework for teacher knowledge emphasizes the connections and interactions, between content, pedagogy, and technology (Mishra and Koehler, 2006). In this model, knowledge about content (C), pedagogy (P), and technology (T) is central for developing good teaching. However, rather than treating these as separate bodies of knowledge, this model emphasises the interconnection of these three bodies of knowledge.

PRE-SERVICE TEACHERS AND TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPACK)

As discussed in the previous paragraphs the challenge for teacher preparation programmes is to prepare pre-service teachers to integrate knowledge of the subject matter with knowledge of teaching and learning (Niess, 2005; Shulman, 1986). For technology to become an integral component or tool for teaching and learning, science pre-service teachers must also develop an overarching conception of their subject matter with respect to technology and what it means to teach with technology (TPACK).

Traditionally, teacher preparation programs have depended on one course focused on learning about technology. Most teacher education institutes currently offer at least one if not a

number of courses that address the need to scaffold pre-service teachers' development of expertise for ICT integrated teaching. However, many of these courses in the past focused on technological skills increasing the likelihood of pre-service teachers' using ICT in the classrooms when they become teachers (Hammond *et al.*, 2009; Mishra, Koehler, & Kereluik, 2009; Mims *et al.*, 2010). However a computer alone cannot help students learn science (Koch, 2005). Studies have reported that pre-service teachers are inadequately prepared for ICT integrated teaching even after the study of the above mentioned courses (Kay, 2006; Mims *et al.*, 2010).

Recommendations have been proposed to design and refine pre-service teachers ICT integration courses from a variety of different authors, for example integrating technology in all courses in the teacher preparation program and requiring pre-service teachers to teach with technology in their student teaching experience to develop the pre-service teachers' skills in designing ICT integrated lessons (Angeli & Valanides, 2005; 2009; Chai *et al.*, 2010; Jimoyiannis, 2010; Koehler, Mishra, & Yahya, 2007; Niess, 2005). It has also been suggested that teacher educators need to build flexibility and space into their course design in order to provide students with the opportunity to fulfil their potential as teachers (O'Neill, 2000). This research is looking at how teacher preparation programmes guide pre-service teachers' development of a TPACK to prepare teachers to teach where technology significantly impacts and changes teaching and learning methodologies in primary science classrooms (Niess, 2005).

OVERVIEW OF RESEARCH PROJECT

This research is ongoing and this paper reports on its design and methodology. It is divided into two phases with clearly defined aims:

Phase one: exploratory phase

- To investigate pre-service primary teachers' TPACK confidence and their views on teaching science in Technology Rich Environments (TRE).
- To investigate pre-service primary teachers' classroom practices and use of technologies during their school placement.
- To investigate challenges faced by and needs of pre-service primary teachers for successful integration of technology in science teaching.

Phase two: integrated approach to science education modules

- The overall aim of this phase is to use a variety of teaching and learning tools to strengthen student's conceptual understanding and problem solving skills (SMK).
- To use an integrated approach to Science Education Modules where technology is used to further develop the students PCK and their TPACK to prepare teachers to teach where technology significantly impacts and changes teaching and learning methodologies in primary science classrooms.

Phase two is divided into several different projects with the following objectives:

WP1: The use of videos to consolidate learning occurring in science workshops and to promote further reflective and critical engagement with such tasks.

- To use recording equipment, video editing software and screen casting to consolidate learning occurring in science education workshops and to promote further reflective and critical engagement with such tasks (SMK).
- To use recording equipment, video editing software and screen casting to design appropriate and effective teaching and learning resources for the primary science classroom (PCK, TPACK).

WP 2: The use of concept mapping and multimedia on improving the problem solving skills of students, while enhancing their understanding of Science.

- To use Concept Mapping software to identify students' understandings, misconceptions and conceptual change in science (SMK).
- To investigate the potential that concept mapping and multimedia may have on improving the problem solving skills of pre-service teachers, while enhancing their understanding of science and their TPACK.
- To develop resources and lessons using concept mapping software for the primary science classroom (PCK, TPACK).

WP 3: Using Animation software in Science Education

- To investigate the use of animation software in assessing ITE students' knowledge of misconceptions in science and how it can be used in the classroom to teach science in an effective manner (SMK, PCK, TPACK).

- To investigate the use of animation software in developing pre-service teachers' ability to design problem solving tasks for the primary science classroom (PCK, TPACK).
- To investigate the use of animation software in developing teaching resources for the primary science classroom, to engage pupils with scientific concepts and eliciting their pre- and misconceptions (PCK, TPACK).

RESEARCH FRAMEWORK

The science modules concentrate on the development of the students' knowledge and thinking in a manner that considers the development of an overarching conception of teaching with technology. The lectures challenged the pre-service teachers to reconsider their subject matter content and the impact of technology on the development of that subject matter as well as on teaching and learning (Niess, 2005). The focus is on using technology for enrichment rather than replacement in science teaching, exploring how a technology tool could be used to foster meaningful learning.

Niess' (2005) framework for TPACK in a teacher preparation programme will be applied to this research: (1) an overarching conception of what it means to teach particular subject, integrating technology in the learning (2) knowledge of the instructional strategies and representations for teaching particular topics with technology (3) knowledge of students' understandings, thinking and learning with technology in a particular subject (4) knowledge of curriculum and curriculum materials that integrate technology with learning in the subject area (Borko and Putman, 1996).

METHODOLOGY

Phase One: Exploratory Phase

Phase one uses a non-random purposeful sample to gather data from pre-service teachers, using questionnaire and interviews to collect both quantitative and qualitative data.

Phase Two: Integrated Approach to Science Education Modules

This research is divided into three separate but interlinking Work Packages.

Work Packages	Technologies Used	Details	Data Collection
WP1	Recording equipment (iPod Touch and video recorders) and Articulate Presenter. Video editing software (ULead Video Studio).	Setting out problem solving tasks using recordings. Assessment for learning activities using recordings, after the workshops to further consolidate their learning and to ensure conceptual understanding.	Student questionnaires and interviews on the use of video recordings to consolidate learning and to promote reflective practices and critical engagement. Correction of tasks. Post-innovation questionnaires and interviews to evaluate the objectives set out in this project. Evaluation and reflection (reflective diary) by the lecturer.
WP 2	SMART Concept Mapping Software.	Workshop on concept maps and how to construct concept maps, introducing students to the SMART Concept Mapping Software. Students will be set several problem-solving tasks to design their own concept maps. The concept maps will be corrected and analysed by the lecturer.	Pre- innovation questionnaires and interviews on the use concept maps. Correction of concept maps. Post-innovation questionnaires and interviews on the use concept maps. Evaluation and reflection (by the lecturer).
WP 3	Go Animate	Introduce the students to concept cartoons. Students design a concept cartoon. The lecturer will design and develop some animations using Go Animate to use in the lectures to introduce the students to the software. Students design an animation to engage pupils with scientific concepts and eliciting their pre- and misconceptions.	Pre- innovation questionnaires and interviews on the use animations in the science classroom. The animations will be assessed by the lecturer to identify the student's knowledge of misconceptions in science and their ability to design problem solving tasks for the primary science classroom.

Table 1: Details of work packages in this research study.

CONCLUSION

Initial teacher education has long been identified as a key site for the development of SMK and PCK. More recently, the affordances offered by technology to transform the learning process has led to the identification of TPACK as a core concept of teacher education. The proposed research seeks to embed TPACK across Science Education to support and enhance learning.

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MST CURRICULA FOR 5, 8, 11 AND 13 YEAR OLDS RESEARCHED BY THE SECURE PROJECT ACROSS EUROPE

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ABSTRACT

The study focuses on the mathematics, science and technology (MST) curricula offered to 5, 8, 11 and 13 year old learners in ten European countries. The research framework is constructed upon the curriculum spider web (van den Akker, 2003), in which aspects of curriculum and the relations among them are represented on a spider web. The study presents examples of cross-country results encountered during the data analysis of curricula documents and teachers' questionnaires concerning several items of the spider web linked to the European list of the key competences.

INTRODUCTION

In its latest policy initiatives and outputs in education and training the European Union restated the importance of science literacy and numeracy as fundamental elements of key competences (European Commission 2010; European Council, 2009, 2010). It was recognized that:

...more investment should be undertaken to increase the number of graduates in science, technology, engineering and mathematics (STEM) so as to create the right conditions to deploy key enabling technologies, essential in the R&D and innovation strategies of industry and services (European Commission, 2010).

The aim of the study presented in this paper is to examine the state-of-the-art of the mathematics, science and technology (MST) curricula intended for early stages of schooling. The focus of research is to find out whether the balance between the training of future scientists and broader societal needs exists in the documents and everyday school practice. The disturbance of such a balance can prevent the increase of science literacy and numeracy among members of society in general, as well as limit the number of budding candidates for scientists, thus leading to a slowdown in the future development of the European Union and backwardness in its competitiveness compared to other countries.

COUNTRIES, AGES AND MST SUBJECTS

The research was done within the SECURE project founded by the European Union under the Seventh Framework Programme (FP7). The study was conducted in ten European countries or regions with autonomous educational systems: Austria, Belgium (Flanders), Cyprus, Germany (Saxony), Italy, the Netherlands, Poland, Sweden, Slovenia and the United Kingdom (England). Key ages of early education were chosen (Figure 1), i.e. 5, 8, 11 and 13, complementary to the ones researched in TIMSS (2011), ROSE (Sjøberg, S. and Schreiner, 2010) and PISA (OECD, 2006, 2009).

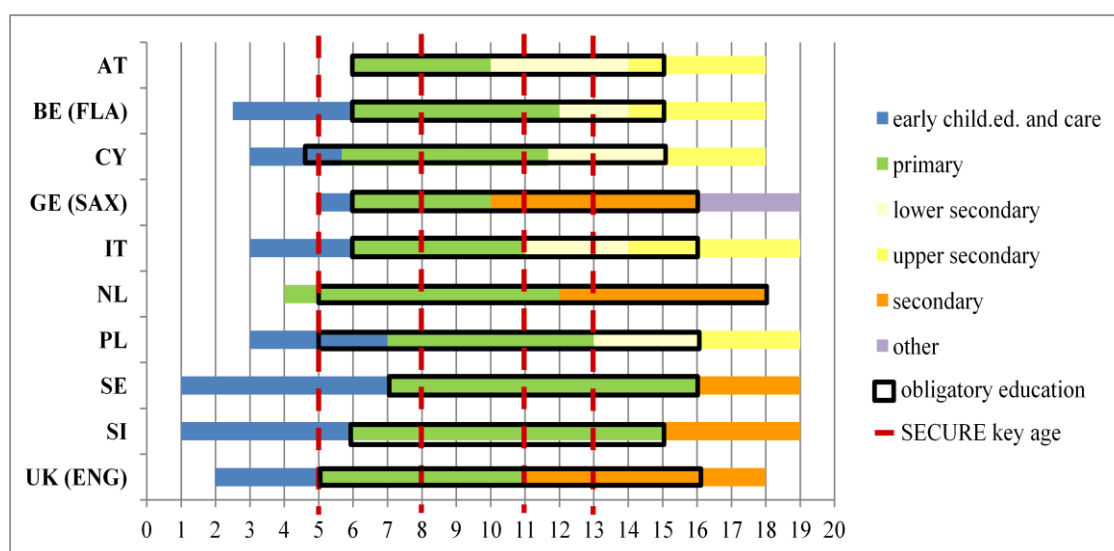


Figure 1: Educational systems (adapted from Eurydice, 2013) in countries or regions participating in SECURE research: AT – Austria, BE (FLA) – Belgium (Flanders), CY – Cyprus, GE (SAX) – Germany (Saxony), IT – Italy, NL – the Netherlands, PL – Poland, SE – Sweden, SI – Slovenia, UK (ENG) – the United Kingdom (England). Only the stages for which the Ministry of Education is responsible are shown. Key ages researched in SECURE project (red dashed line) and periods of obligatory education (black box) are indicated.

The research concerns MST subjects in all occurring forms, M - comprising mathematics, S – comprising: biology, chemistry, physics, physical geography (in some countries), science (integrated), world orientation, social and environmental studies, environmental education, and T – comprising: technology, technics and technology, technology and design, technical crafts.

THEORETICAL FRAMEWORK

A curriculum can be considered, according to Taba (1962), as a “plan for learning”. As such it can be researched from three perspectives: as it is *intended* by the writers, *implemented* by the teachers and *perceived* by the learners (Goodlad, 1979), which is especially useful in the

analysis of the processes leading to the learning outcomes and the effectiveness of curricula. A more detailed approach, concerning the learning aspects of the curriculum, was introduced by van den Akker (2003), who represented the curriculum on a spider web (Figure 2), visualising the relationships between different curriculum components – Rationale in the centre of the picture, surrounded by nine other aspects of learning: Aims and Objectives; Content; Learning Activities; Teacher Role; Materials and Resources; Grouping; Location; Time and Assessment. In view of our overall focus, yet another item - Motivation and Interest - was included in the research.

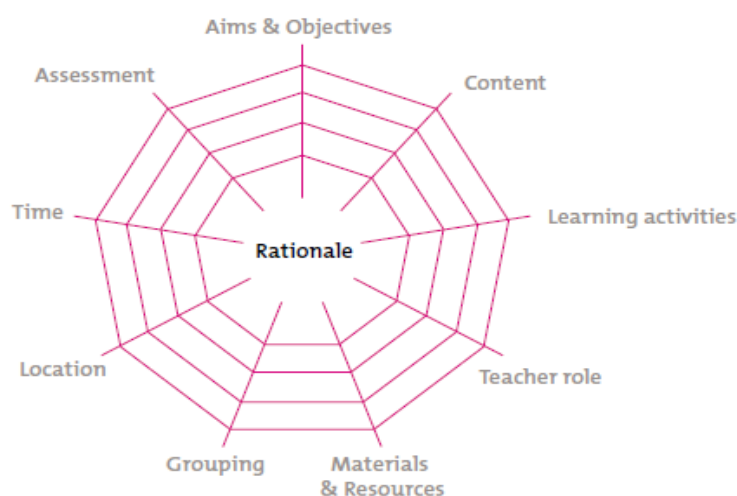


Figure 2: Curriculum spider web (van den Akker, 2003).

METHODOLOGY

Sample

After a pilot study, the systematic collection of data has been performed in 15 classes of each researched age group in every country. The main research took place during the school year 2011/2012. A class could receive an invitation to the project only if at least 50 percent of its pupils were aged 5, 8, 11 or 13 on the 1 September 2011. As far as possible, a variety of classes was selected to obtain a sample spread encompassing public and private schools located in cities, towns and in the countryside. Whenever a class was invited to the research all teachers of MST subjects in this class also took part in the research. Thus altogether almost 600 classes, 9000 learners and 1500 teachers participated in the study

Instruments

The research instruments consisted of a curriculum screening instrument (CSI), and of several school data collection instruments: teacher questionnaires; learner questionnaires (limited to 8, 11 and 13 year olds) and interview protocols for all age groups of pupils and their teachers.

The curriculum screening instrument consist of

1. a semi-structured text, enabling to provide, in a descriptive way, general information about the existing curricula documents and their content, related to the all ten components of the curriculum spider web
2. a set of additional questions providing details about curriculum content, which enabled comparison across ten countries.

The questionnaires were based on existing scientific literature on science education and science curriculum reform (e.g. Atkin & Black, 2003; Black & Atkin, 1996; van den Akker, 1998). Instruments available from previous relevant studies such as Schreiner and Sjøberg, (2004), TIMSS (1995, 1999, 2003, 2007), and PISA (2000, 2003, 2006, 2009) were used as a starting point for the design. The vast majority of the questions were equipped with yes/no answers or based on 3, 4 or 5-point Likert scale. In every questionnaire a box for remarks was included to enable expression of the opinions and thoughts not covered by the research instrument.

The semi-structured interview protocols were developed in order to gather additional information and study learners' and teachers' opinions and attitudes in depth. All learners' instruments were adjusted for age, whilst only one type of questionnaire and one interview protocol was designed for all the teachers.

DATA COLLECTION

The following procedure was implemented for school data collection:

1. All 8, 11 and 13 year old learners filled in the relevant questionnaire. No questionnaire was given to 5 year olds, following the consortium decision, based on the results of a pilot study.
2. All MST teachers of 5, 8, 11 and 13 year olds were asked to complete the questionnaire.

3. Four representatives (two girls and two boys) of each class of 5 year olds were interviewed by two researchers at the same time.
4. Four representatives from six selected classes aged: 8, 11 and 13 were interviewed by two researchers at the same time.
5. All teachers teaching six selected classes of each age were interviewed by two researchers at the same time.

In this paper, selected outcomes derived only from teachers' questionnaires and curriculum screening instrument are presented. The results coming from learners' questionnaires are available in other articles, e.g. Sokolowska, Brzezinka, and Ireson (2013), de Meyere, Sokolowska, Folmer, Rovsek, and Peeters (2013).

RESULTS

A huge amount of data has been collected. However bearing in mind our overall focus on 'balancing the needs between training for future scientists and broader societal needs' the researchers limited the preliminary cross-country analysis to the urgent needs announced by European Union (Key Competences, 2006) as a list of eight key competences, in which those related to MST education can be found, in particular

- Communication skills
- Ability to cooperate
- Searching for information
- Creativity
- Mathematical thinking
- Application of knowledge in everyday life

Here we present the joint results from ten European countries.

OUTCOMES OF CURRICULUM SCREENING

A great variety of different curricula documents were detected during the study, most of them from 2006 or later. The researchers found out that in some countries only a few documents served as a core curriculum (IT, NL, SE, UK), whilst in other countries the number of available legal documents exceeded twenty (SI). The core curricula were predominantly detailed, except for NL, where the relevant documents were very general. The key competences were not listed in any of the documents; however in most countries the

development of key competences was ensured this way or the other. A selection of such findings encountered in core curricula and supporting documents is presented in Table 1.

Record	Countries ¹
The usage of ICT tools is important and recommended in MST subjects.	AT, BE (FLA), CY, DE (SAX), IT, PL, SI, UK (ENG)
Emphasis put on media and searching for information competences.	AT, BE (FLA), CY, DE (SAX), IT, PL, SI
Promotion of the critical thinking development.	AT, BE (FLA), CY, DE (SAX), PL, SE, SI
Recommendation for working in small groups at least sometimes (e.g. during some experiments).	AT, BE (FLA), CY, DE (SAX), PL, SI
Recommendation for implementing a formative assessment.	AT, BE (FLA), CY, DE (SAX), IT, PL, SE, SI
List of developmental objectives for mathematics education.	AT and CY – a lot; BE (FLA), DE (SAX), IT, SI - some
Promotion of context-based learning.	AT, BE (FLA), CY, DE (SAX), IT, PL, SE, SI, UK (ENG)
Connecting topics to interest of students.	AT, BE (FLA), SI
Inclusion of elements ² of inquiry-based methodology	AT, BE (FLA), DE (SAX), IT, PL, SI
Mentioning teaching approaches considered as ones enhancing attractiveness of MST subjects	AT, BE (FLA), DE (SAX), IT, PL, SE, SI
Provision of systemic solutions to identify talented students	AT, SI
Anticipating a need to adapt didactic methods/topics/activities to children with different performance levels or interest.	AT, DE, SE, SI

Table 1: Selection of MST curricula records supporting development of EU key competences and the list of countries including those records in their legal documents.

¹Table does not include information about NL.

²No records of the entire IBSE methodology.

The results show that intended MST curricula contain records in line with the European Union's concern about development of the key competences, and thus in principle supports the growth of a competence-based society. However it is worth noticing that curricula designers rarely pay attention to differentiation in learning, especially in relation to high-achievers and those who show any interest beyond curriculum, which contradicts the existence of balance between the educational needs of future scientists and other society members.

Among ten European countries only two (AT and SI) have in their curricula all the records indicated in Table 1.

TEACHER'S OPINIONS

In order to learn how teachers implement the curricula records supporting development of EU key competences, several questions have been asked in teachers' questionnaires. In the following graphs the collective results based on the answers of all teachers teaching 5,8,11 and 13 year olds in ten European countries are presented.

Use of computers in MST lessons

In question 6.1 of the questionnaire, teachers were asked to answer "How often do you usually ask your pupils to do the following", followed by over a dozen particular activities, among which the use of computers to solve problems was mentioned. The answers are collected in Figures 3 and 4, respectively for teachers of mathematics, and science and technology.

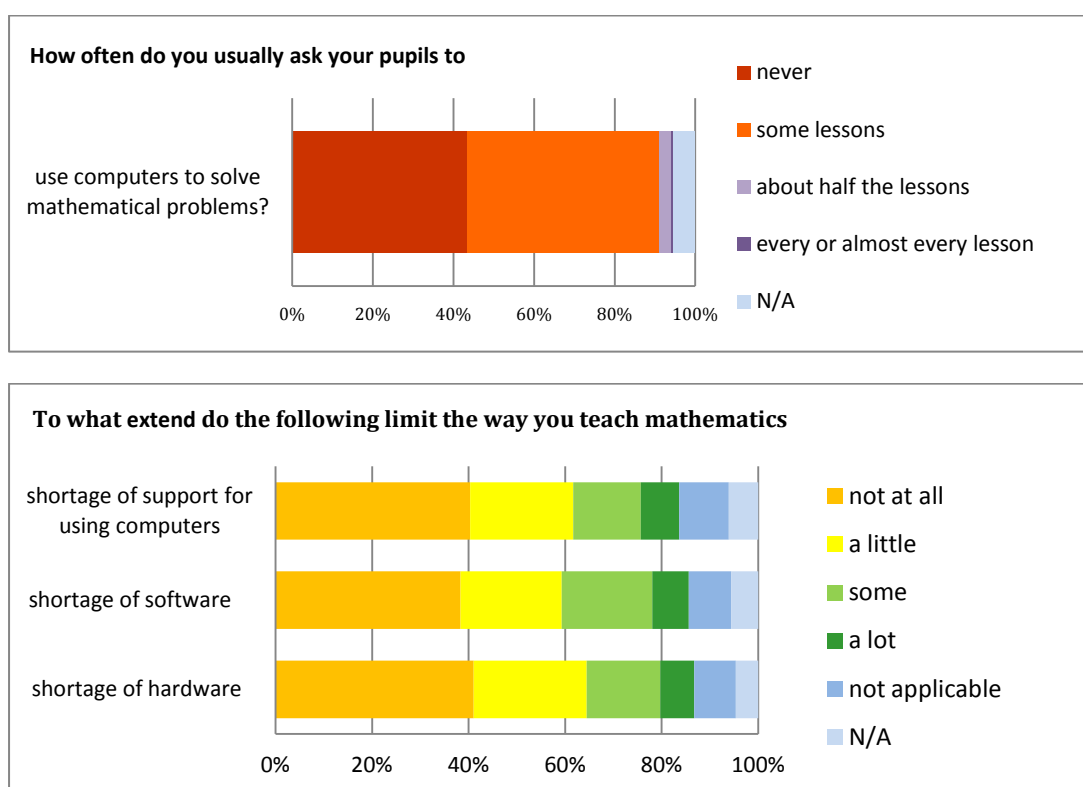


Figure 3: Questions addressing usage of computers in solving problems in mathematics lessons. Summation of answers derived from teachers' questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posed in the questionnaire. Labels on the right indicate possible answers (4- and 5-point Likert scales); N/A stands for "no answer".

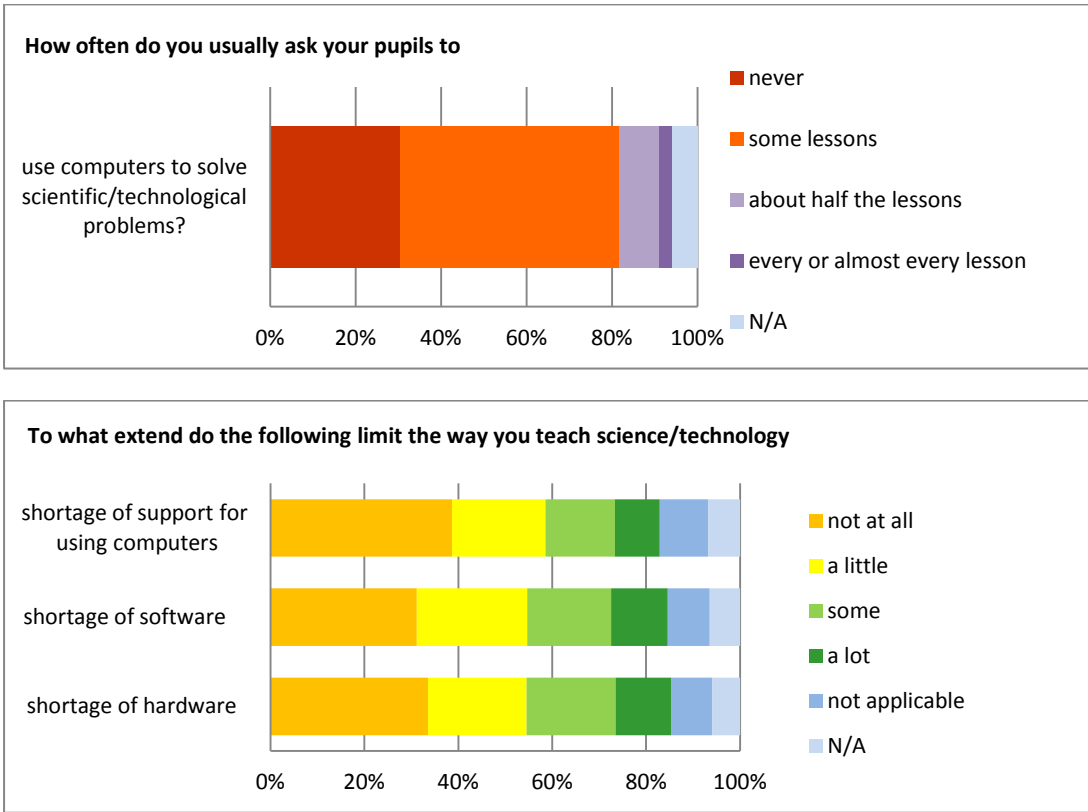


Figure 4: Questions addressing usage of computers in solving problems in science and technology lessons. Summation of answers derived from teachers’ questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posed in the questionnaire. Labels on the right indicate possible answers (4- and 5-point Likert scales); N/A stands for “no answer”.

It is evident that 40 percent of mathematics and 30 percent science and technology teachers never ask their pupils to use the computers to solve problems during lessons and approximately 50 percent of all teachers do it “in some lessons”. At the same time some 60 percent of mathematics and 55 percent of science and technology teachers feel limited in their teaching by shortage of any of the following: hardware, software or support for using computers.

It seems that despite the emphasis of use of ICT tools, computers are still not frequently used to support MST teaching and learning. The answers about limitations due to ICT tools shortage are more ambivalent: either the schools are quite well equipped or most of the teachers do not see any pressing need for use of computers, or both.

Group Work

When asking about learning activities, teachers were addressed with two questions concerning grouping: “How often do you usually ask your pupils (a) to work on problems on their own without guidance and (b) to work together in small groups. The collection of answers is presented in Figures 5 and 6.

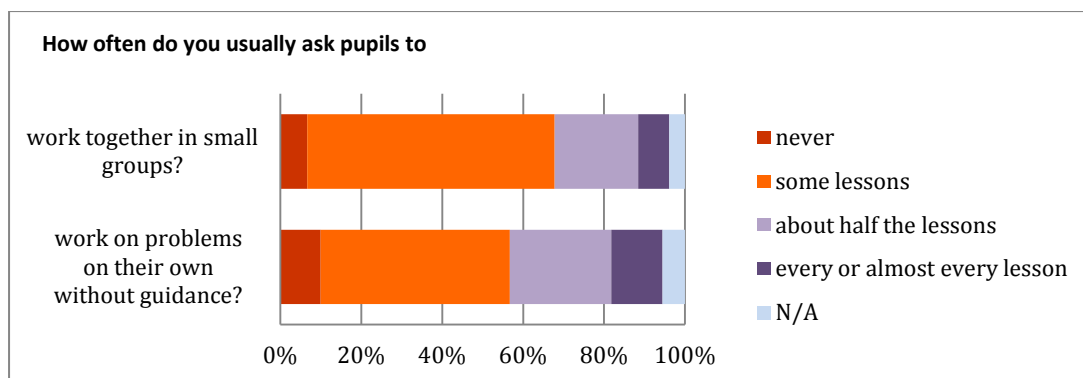


Figure 5: Questions addressing grouping during mathematics lessons. Summation of answers derived from teachers’ questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posted in the questionnaire. Labels on the right indicate possible answers (4-point Likert scale); N/A stands for “no answer”.

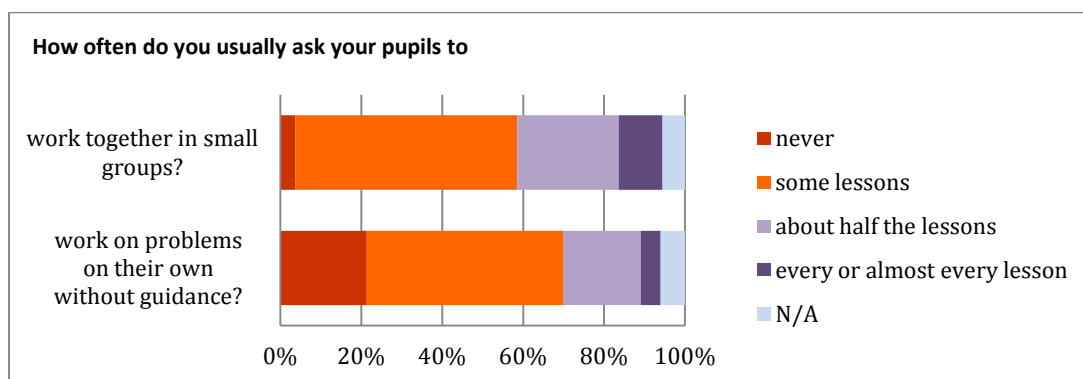


Figure 6: Questions addressing grouping during science and technology lessons. Summation of answers derived from teachers’ questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posed in the questionnaire. Labels on the right indicate possible answers (4-point Likert scale); N/A stands for “no answer”.

The results show that pupils more often work in small groups in science and technology lessons than in mathematics lessons. Nevertheless work in small groups in most of the lessons is practiced by no more than 28 percent and 36 percent of the teachers, respectively in mathematics, and science and technology classes. Comparing to individual work, teachers report that in mathematics pupils work more on their own than in small groups, whilst in science and technology lessons it is quite the opposite.

The research outcomes draw a positive trend towards implementing the group work approach into everyday teaching of MST subjects across Europe, but still it seems to be only a half-

way through systemic acceptance of its importance, comparably to the moderate attention paid to a group work in core curriculum documents, see Table 1.

Context-based learning

Context-based learning was addressed through three questions concerning learning activities: “How often do you usually ask your pupils (a) to relate what they are learning in MST to their daily life, (b) to take current events as a starting point for learning MST and (c) to work on realistic problems during MST lessons. The summation of answers is reported in Figures 7 and 8.

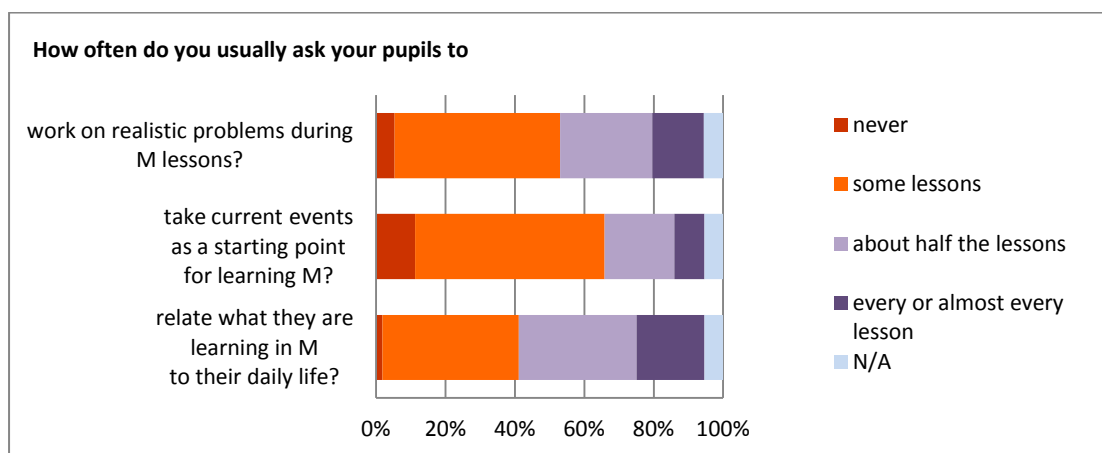


Figure 7: Questions related to context-based learning in mathematics lessons. Summation of answers derived from teachers’ questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posed in the questionnaire. Labels on the right indicate possible answers (4-point Likert scale); N/A stands for “no answer”.

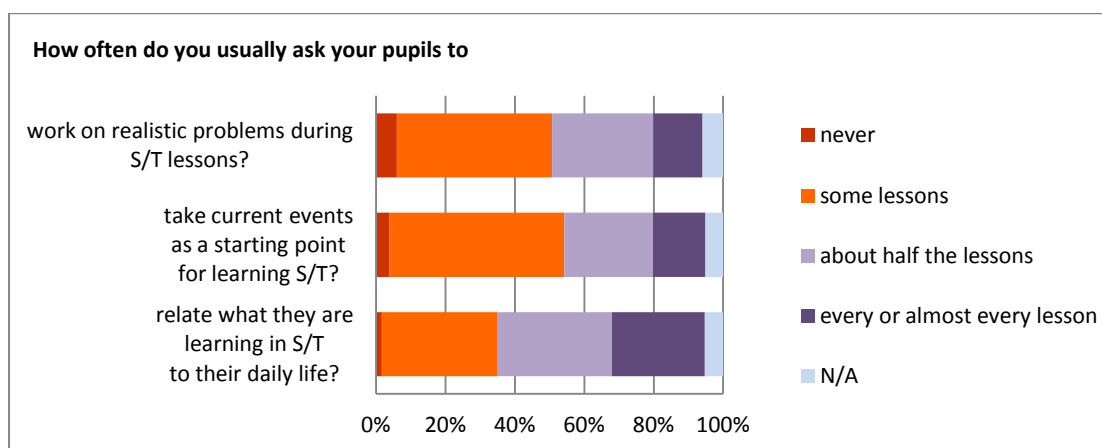


Figure 8: Questions related to context-based learning in science and technology lessons. Summation of answers derived from teachers’ questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posed in the questionnaire. Labels on the right indicate possible answers (4-point Likert scale); N/A stands for “no answer”.

Noticeably in all three subjects pupils are asked to relate what they are learning to their daily life, in at least half of the lessons, for example by 53 percent of mathematics and 60 percent of science and technology teachers. Also working on realistic problems and taking current events as a starting point for learning is commonly present during MST classes.

It seems that recommendation for promotion of the context-based learning, included in MST curricula in every researched country (see Table 1), is taken seriously by most of the teachers of all MST subjects at all ages of schooling and it is widespread across Europe.

Practical Work

In order to investigate how much of practical work is present in the classroom and detect possible limitations to its implementation, several questions from teachers' questionnaires have been analyzed. First of all mathematics teachers were asked "How often do you usually ask your pupils to measure things in the classroom and around the school", whilst science and technology teachers were asked how often they usually ask their pupils (1) to observe natural phenomena and describe what they see, (2) to design or plan experiments or investigations, and (3) to conduct experiments or investigations. Secondly, teachers needed to answer questions about potential limitations to implementation of practical activities, like equipment or time. The collection of relevant data is shown in Figures 9 and 10.

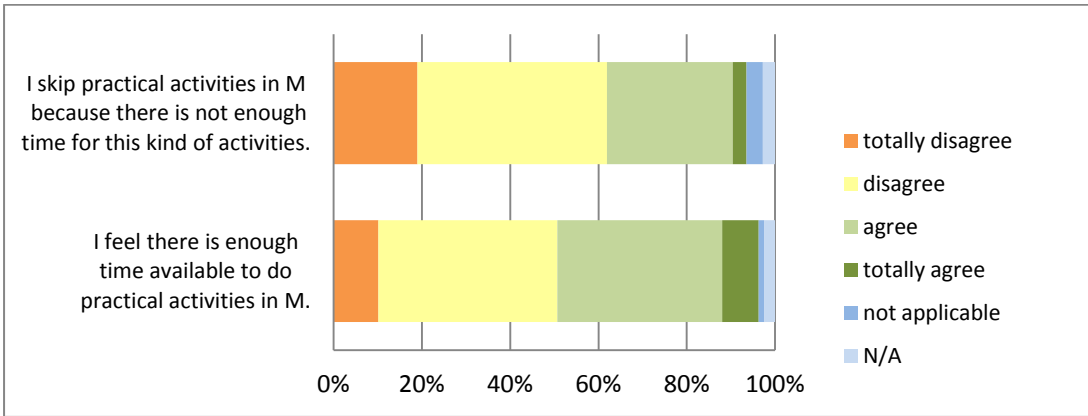
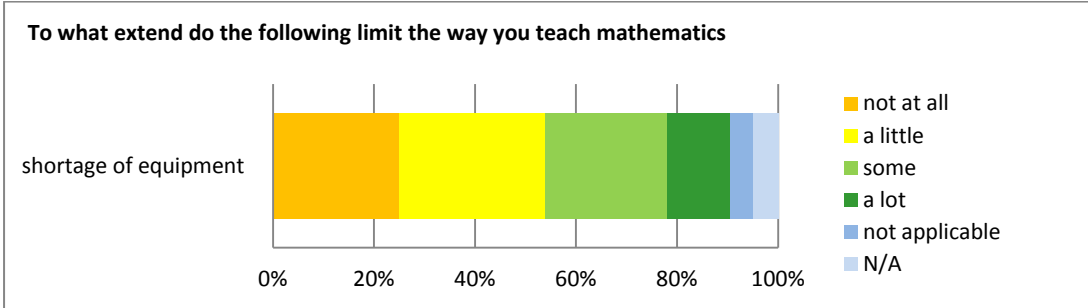
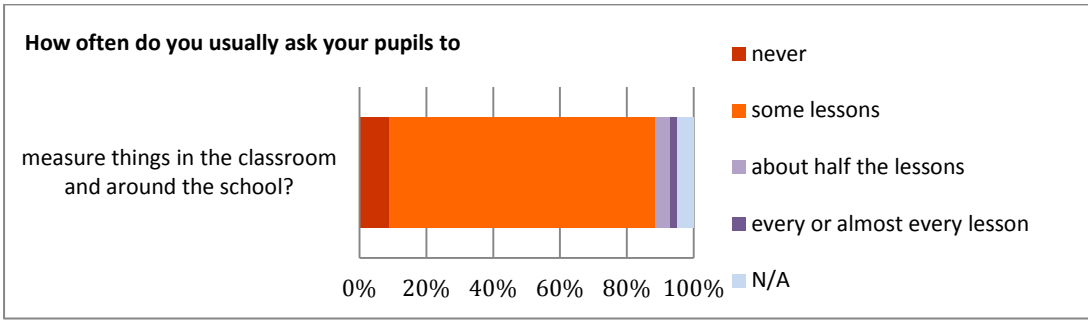


Figure 9: Questions related to practical activities and their possible limitations in mathematics lessons. Summation of answers derived from teachers’ questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posed in the questionnaire. Labels on the right indicate possible answers (4- and 5-point Likert scales); N/A stands for “no answer”.

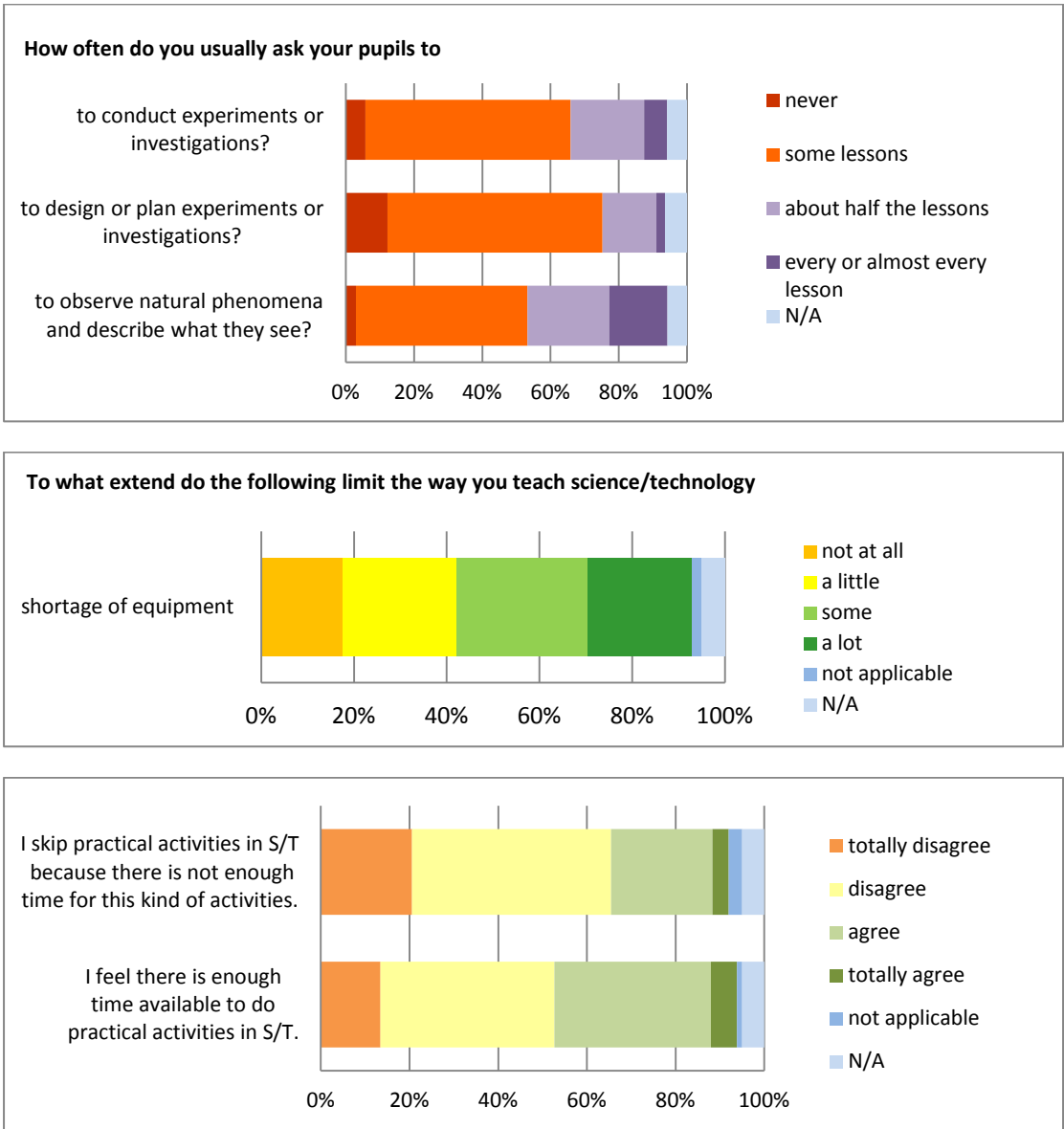


Figure 10: Questions related to practical activities and their possible limitations in science and technology lessons. Summation of answers derived from teachers' questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posed in the questionnaire. Labels on the right indicate possible answers (4- and 5-point Likert scales); N/A stands for "no answer".

The results show that in MST practical activities are proposed, at least in some lessons, by some 80 percent of teachers, except that in science and technology frequency of time devoted to practical activities shifts towards "half of the lessons" or even "every lesson". At the same time, limitation in teaching due to shortage of equipment for practical work is somewhat ambivalent and more pronounced by science and technology teachers, than by mathematics teachers. A bit more than half of the MST teachers disagree there is enough time available to do practical work during classes, but at the same time 60 percent of them disagree they skip practical activities due to the lack of time.

It seems that time and equipment conditions for implementation of practical work in MST lessons vary a lot, most probably from country to country and between ages, but also possibly from school to school. This aspect needs more detailed investigation, which is however beyond the scope of this paper. Definitely, at least some teachers try to follow recommendations of Rocard (2007) and Osborne and Dillon (2008) at least in some of the lessons.

Analytical thinking and communication skills

Analytical thinking and communication skills are one of the most desired competences in a competition job market. Such skills need to be developed for a long time, preferably starting at an early age. We enquired from teachers how often they pay attention to this aspect. In mathematics we asked them three related questions: “How often do you usually ask your pupils (1) to explain their answers, (2) interpret data in tables, charts or graphs, and (3) to work on problems for which there is no immediately obvious method of solution”, whilst in science and technology teachers were asked about how often they usually ask their pupils to give explanations about something they study. The results are presented in Figures 11 and 12.

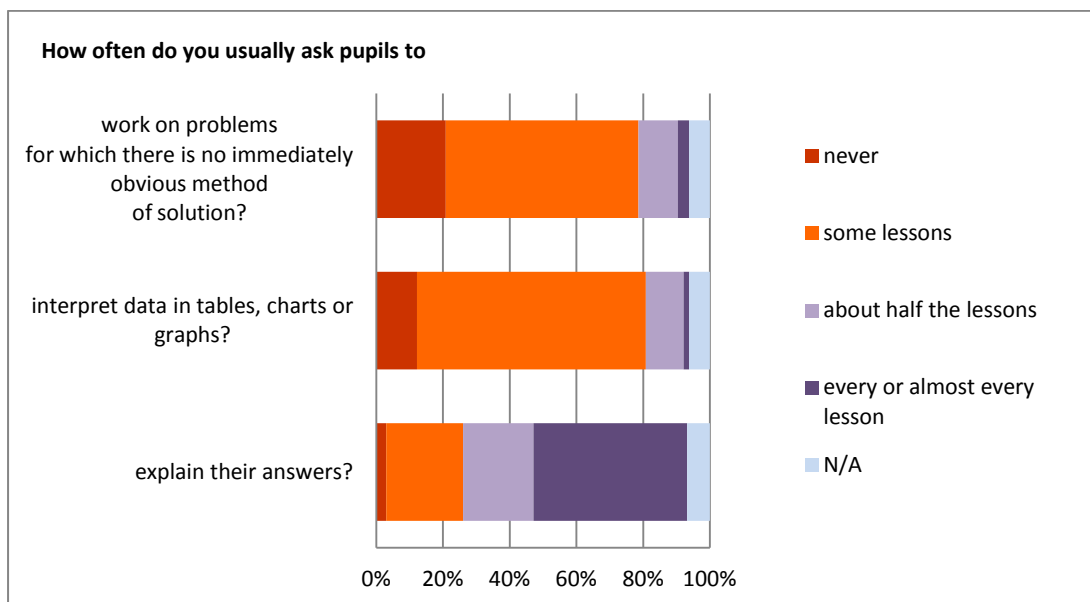


Figure 11: Questions related to activities developing analytical thinking and communication skills in mathematics lessons. Summation of answers derived from teachers’ questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posed in the questionnaire. Labels on the right indicate possible answers (4- point Likert scale); N/A stands for “no answer”.

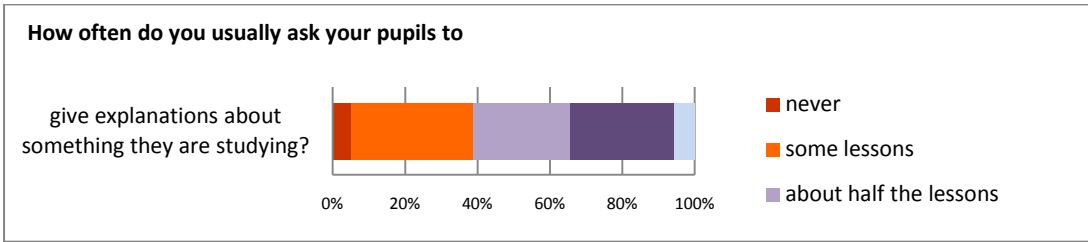


Figure 12: Questions related to activities developing analytical thinking and communication skills in science and technology lessons. Summation of answers derived from teachers’ questionnaires for ages 5, 8, 11 and 13 in all ten countries. Heading and labels on the left indicate questions posted in the questionnaire. Labels on the right indicate possible answers (4- point Likert scale); N/A stands for “no answer”.

The figures show that 67 percent and 55 percent of teachers in mathematics, and science and technology, respectively, demand explanations to the answers in at least half of the MST lessons. In addition to that, the majority of teachers ask pupils to practice analytical thinking in at least some mathematics lessons.

Analytical thinking and communication skills may be developed in fact in every MST lesson. It seems that such an opportunity is still underestimated by MST teachers, although they make some attempts in this regard.

CONCLUSION

Research of mathematics, science and technology curricula in the ten European countries, involved in the SECURE project, showed a diversity of schooling systems and approaches to legal curriculum documents as well as a great variety of MST subjects across countries and ages.

Huge data collection in SECURE enables us to examine MST curricula from three different perspectives: as they are intended by the writers, perceived and implemented by the teachers and finally, experienced by the learners. In this study the presence of records supporting the development of the European key competences and their implementation by MST teachers into everyday practice have been examined and the results shown jointly for ten European countries. The variety of qualitative and quantitative data gathered in the SECURE project allows us to look at the MST education in Europe from many other angles, including gender differentiation (Sokolowska et al., 2013) or socio-environmental aspect (de Meyere et al., 2013), to mention only a few.

In general the study shows that MST curricula indirectly addresses the entire list of key competences, relevant to MST education; however the list itself never appears in any document. Also the emphasis put on particular statements related to this list varies a lot from country to country. Further on in school practice, teachers seem to follow the records concerning development of the key competences; however the data show that whatever is happening in the classroom never goes beyond the emphasis encountered in the legal documents. In particular more efforts are needed in implementation of group work, more practical activities and tasks enhancing the analytical thinking.

The overall trend is that MST curricula follow the European recommendations (Key Competences, 2006; Osborne 2008; Rocard 2007); however the relevant records seem to be not detailed or extended enough to persuade the teachers to implement them immediately and thoroughly. One of the solutions can be the creation of more favourable conditions for undertaking continuous professional development (see de Meyere et al., 2013) that would put more emphasis on those features of curricula that are significant for future Europe and their translation into everyday practice.

ACKNOWLEDGEMENT

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The SECURE Project: Analysis of perceptions of teachers and learners on topics related to the IASSEE conference

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ABSTRACT

SECURE is founded as a collaborative project under FP7 to research current mathematics, science and technology (MST) curricula offered to 5, 8, 11 and 13 year old learners across 10 European countries. The instruments used in the study consist of a transnational comparative screening instrument for MST curricula, along with: teacher questionnaires, learner questionnaires (limited to 8, 11 and 13 year olds) and interview protocols for all age groups of pupils and their teachers. A mixed method approach for the analysis of the MST curricula is applied throughout three different representations of the curriculum: the intended curriculum (formal curriculum documents), the implemented curriculum (the actual process of teaching) and the attained curriculum (focus on learning experiences of the learners). This paper focuses on whether the curricula promote social learning and learning for a globalised world.

INTRODUCTION

SECURE is founded as a collaborative project under FP7 to research current mathematics, science and technology (MST) curricula across Europe. The research focuses on the MST curricula offered to 5, 8, 11 and 13 year old learners in 10 European countries. Altogether almost 9000 pupils, 1500 teachers and 600 schools took part in the data collection phase of the project. The ten components of the curriculum spider web (van den Akker, 2003) (Rationale, Aim and Objectives, Content, Learning activities, Teacher role, Materials and Resources, Grouping, Location, Time, Assessment) with the additional item 'Motivation and Interest' provide us with a wide perspective on MST education, which, given the large amount of data, form solid ground for analysis. However, the extension of the research does not permit us to say that the results are representative of all practices; nevertheless it is possible to extract interesting trends. The research is based on three pillars: (1) the comparative study of the written official curricula, (2) questionnaires for 8, 11 and 13 years old learners and also for their teachers, and (3) interviews with the teachers and groups of four learners from each age group.

This strategy permits us to draw conclusions from the intended curriculum, the curriculum as it is implemented by the teachers, and the curriculum as it is experienced by the learners - the attained curriculum.

This paper addresses themes relating to social justice and social learnings and demonstrates how the different types of data can lead to a global view on science curricula. As the project is not fully completed all findings shown are in a preliminary stage, and therefore the results and conclusions need more fine tuning.

SOCIAL JUSTICE

“Social justice” in curricula documents

MST curricula, as a part of general education, do mention in almost all cases the need to encourage social justice:

A representative citation comes from Cyprus (for all ages), written in all their MST curricula:

(Education) contributes to the shaping of people in order to have the following features: ...

they are citizens who are characterized by A democratic fighting spirit, courage and social responsibility and inspired by the values of social justice and solidarity, formulate and experience conditions of equality between the sexes, respect and protect the natural and cultural environment and promote sustainable development, give rise to personal mental and physical well-being, to self-knowledge, to the physical exercise in rational nutrition and welfare, the conscious shaping of free time as a period of creative activity and pleasant socialization, the ability to demand adequate health conditions and to face the several mechanisms of influence and manipulation.

Almost all other countries also put these kinds of aims in their rationales, although sometimes using different terminology. Therefore attitudes to social justice are regarded as very important. Further examples are outlined below:

- Austria (AT): 'Education has to qualify children for: self-determination, participation in social and cultural developments and taking responsibility'.
- Germany (GE): 'Independence, responsibility, tolerance towards other people, cultures and life styles as well as disabled people'.
- Netherlands (NL): 'Education addresses [...] the acquisition of social, cultural and physical skills'.

Statements like the ones above in the rationale imply that throughout the whole curriculum teachers of all age groups need to consider these issues.

“Social justice” in questionnaires

Focusing on questionnaires, the spider web item “Learning activities” gives an idea of how this intended “social” curriculum goal is attained by the learners:

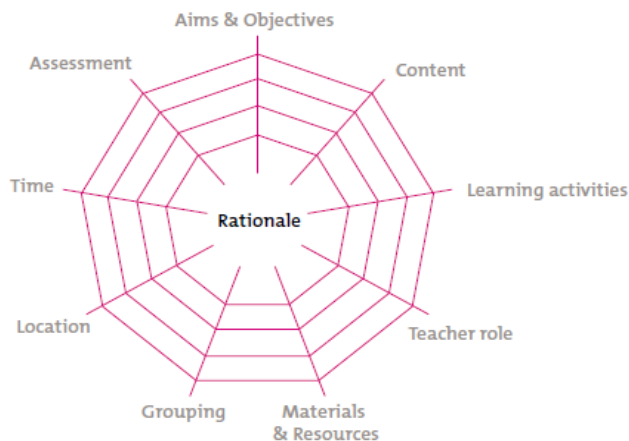
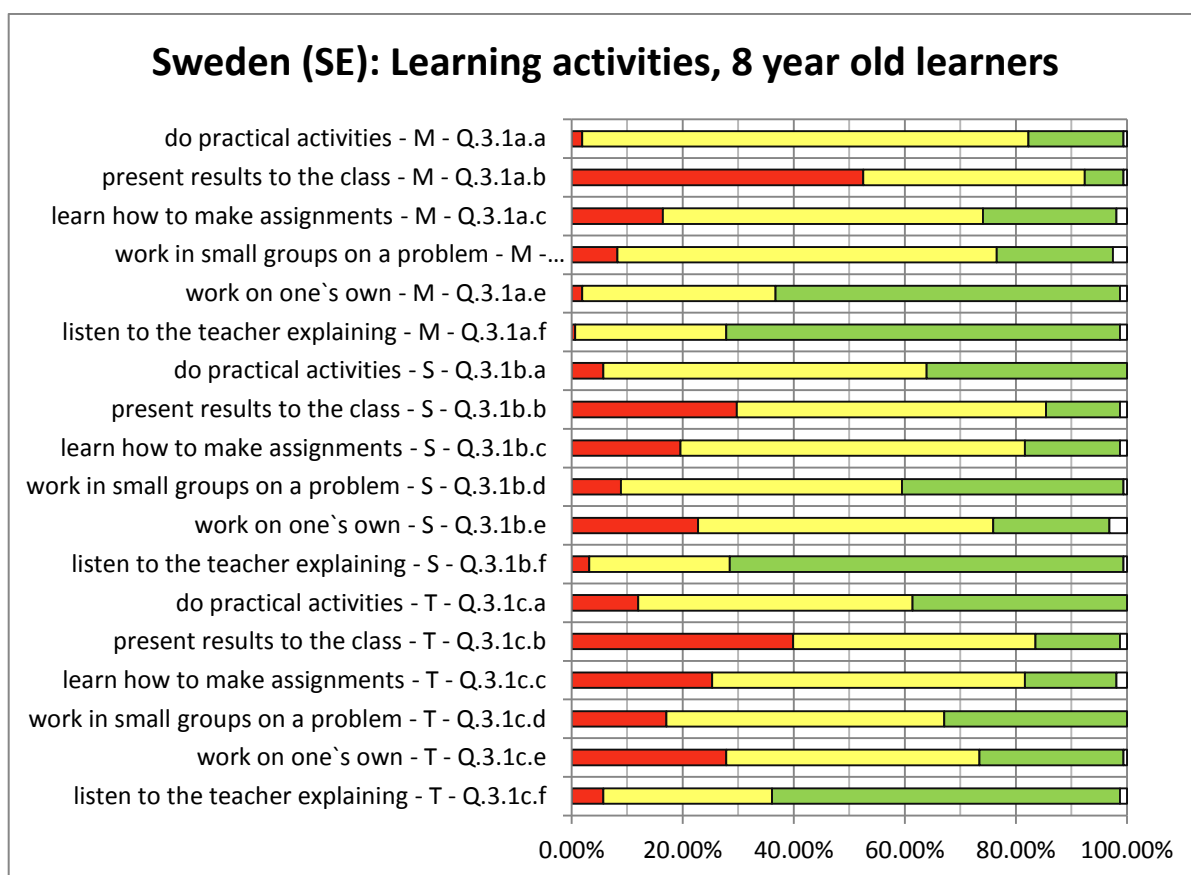


Figure 1: Curriculum spider web (van den Akker, 2003).



Graph 1: Opinions of 8 year old learners from Sweden (SE) on Learning activities; (N=158) possible answers indicated: left: “never”, middle “sometimes”, right “often”

In order to establish how social skills are encouraged two questions are relevant: “How often do you work in small groups?” (Q1) and “How often do you present results to the class?” (Q2)

It is interesting to note the frequency with which the “never” possibility is chosen. The other answers that can be given are “sometimes”, or “often”. For example the results for Sweden are as follows:

Sweden (SE)	Q1 (small groups), answer “never”, %			Q2 (presentations) answer “never”, %		
	Mathematics	Science	Technology	Mathematics	Science	Technology
Learners 8 years	8	9	17	53	30	40

Table 1: Frequency of Swedish 8 year old learners answering “never” to Q1 and Q2

By expanding the table with information from 11 and 13 year old learners a comparison along an age range is possible

Sweden (SE)	Q1 (work in small groups), answer “never” in %			Q2 (present to the class), answer “never” in %		
	Mathematics	Science	Technology	Mathematics	Science	Technology
Age of learners						
8 years	8	9	17	53	30	40
11 years	9	4	3	35	27	19
13 years	16	B/C/P 8/5/5	5	49	B/C/P 34/33/32	31

Table 2: Comparison of the frequency of Swedish learners answering “never” to Q1 and Q2

It can be concluded that for Sweden, in general, learners do learn to work in groups “sometimes” to “often” (to enhance their social skills, among other reasons). However, the research also found that presentation skills are only barely taught in the class.

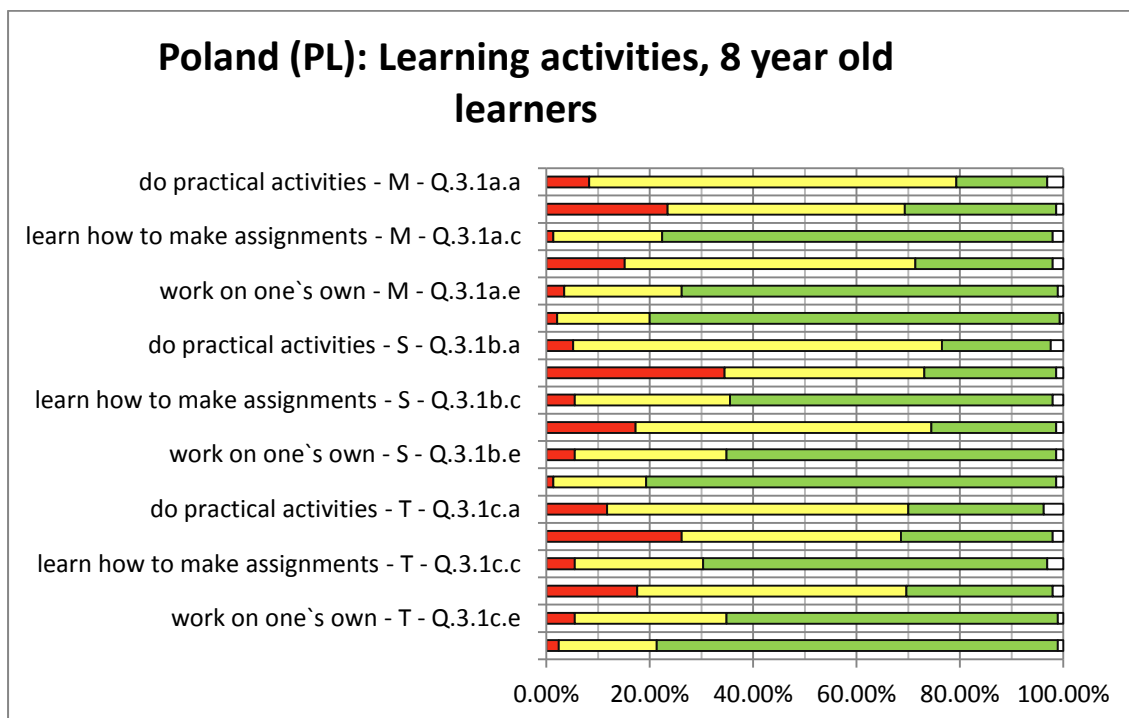
The following graph shows the findings for two further countries (Poland (PL) and Germany (GE)) using the data gathered from 8 year old learners.

Country/Age learners	Q1 (work in small groups), answer “never” in %			Q2 (present to the class), answer “never” in %		
	Mathematics	Science	Technology	Mathematics	Science	Technology
SE: 8 years	8	9	17	53	30	40
PL: 8 years	17	15	18	23	34	26
GE: 8 years	19	13	No Technology	29	20	No Technology

Table 3 Comparison of the frequency of 8 year old learners from different countries answering “never” to Q1 and Q2

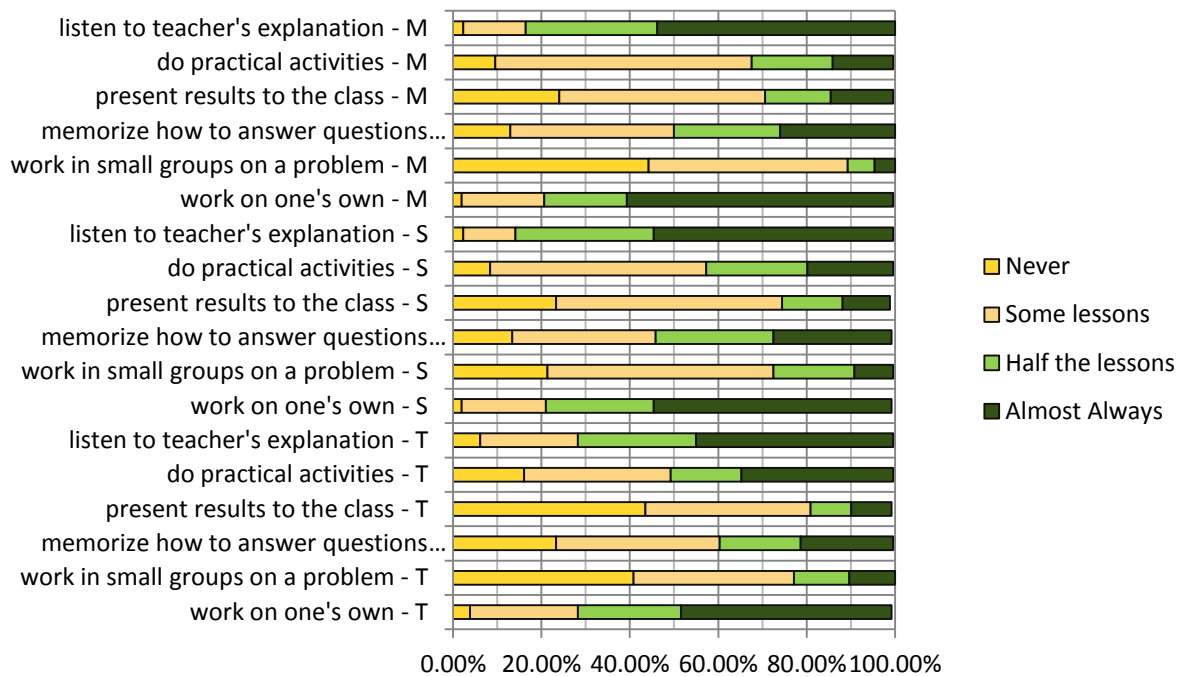
According to the research findings, in Poland there is much less “working in small groups” organized by the teachers of mathematics and science than in Sweden. Germany, having in the rationale “Independence, responsibility, tolerance towards other people, cultures and life styles as well as disabled people” does not score particularly well in comparison to other countries. While the appreciation of these numbers is subject to the individual’s perception, the “never” answer does certainly indicate that in those cases the rationale is not honoured in the class, at least in the perception of the learners.

SECURE asked what learning activities take place in the classes, and the following graph (for Poland) illustrates a set of answers. The same six questions are asked for three disciplines M (maths), S (science), T (technology).



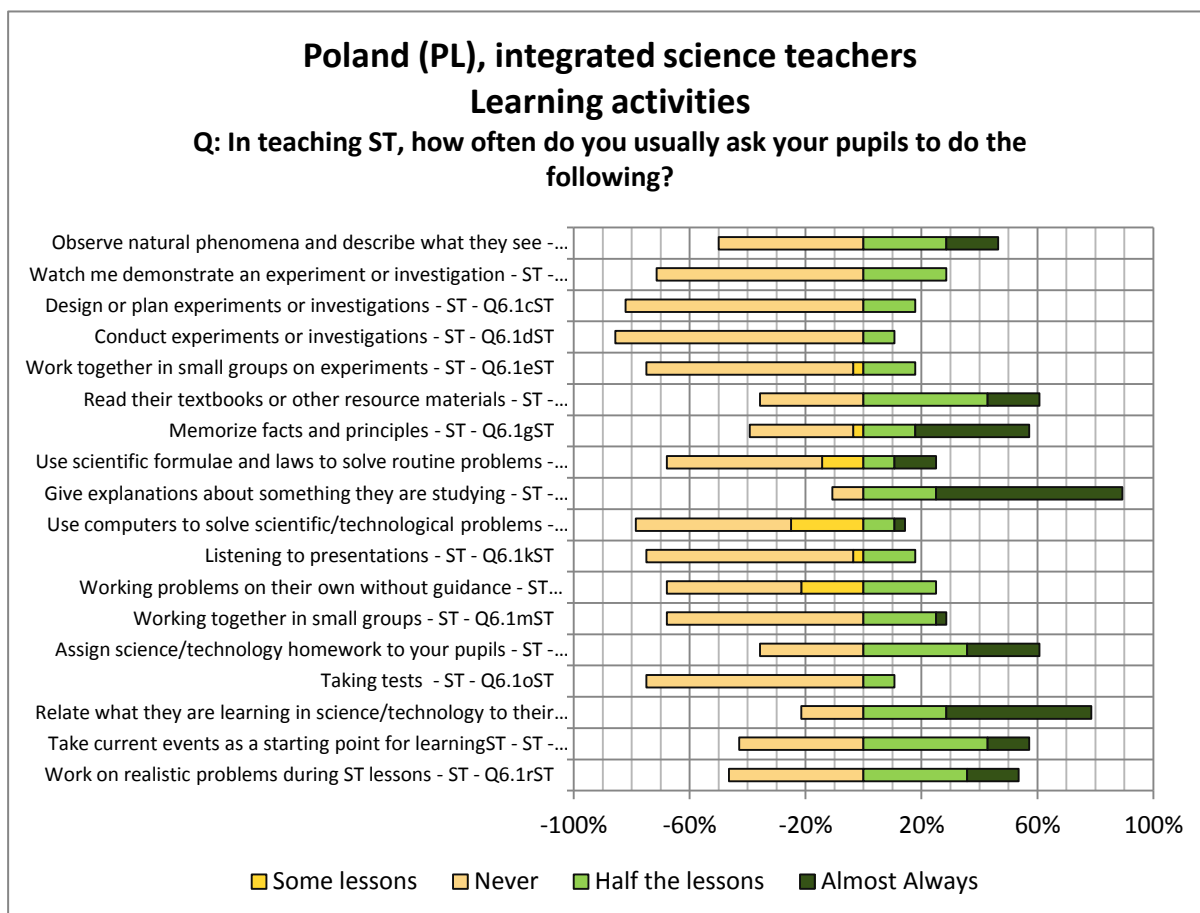
Graph 2: Opinions of 8 year old learners from Poland on learning activities(N=290)
Possible answers: left: “never”, middle “sometimes”, right “often”

Poland (PL): Learning Activities, 11 year old learners



Graph 3: Opinions of 11 year old learners (N=262) from Poland on learning activities

An added value of the SECURE project is that it is possible to compare learners' answers with the teachers' answers:



Graph 4: Opinions of integrated science teachers² of Poland on Learning activities (N=30)

Of the Polish integrated S/T teachers (of 8 and 11 year olds): 68% say “never” to the question “I ask learners to work in small groups”, while 71% says “never” to the question “How often do you ask your students to listen to presentations. The students’ answers are much lower: see table 4:

PL	Q1 (work in small groups), answer “never” in %	Q2 (present to the class), answer “never” in %
	Science	Science
Learners 8 years	17	34
Learners 11 years	21	23
Teachers (both ages combined)	68	71

Table 4: For Poland, answers to the questions Q1 and Q2 by learners and teachers. Two groups of learners are represented here, while their teachers are taken as one group

² Integrated science teachers teach an integrated science course (mostly ages 5, 8 and 11), while specific science teachers teach separate, specific disciplines.

Conclusion: with SECURE data, for the same two questions different approaches are possible: to take as variable the age and see how the numbers evolve; or to look at the different countries (per discipline) and look for trends; or to compare learners and their teachers.

The SECURE questionnaires have 176 questions for teachers, some 250 questions for 13 and 11 year olds and about 110 questions for 8 year old learners. Some numbers depend on local educational systems and hence vary from country to country.

“Social skills” in interviews

Another aspect of training in social skills is “grouping”. Curricula only mention vaguely how teachers should organize lessons. During interviews teachers in many countries say they are the size of their classes hinder them from organising more lessons in smaller groups. Science teachers are motivated to let pupils work in groups during experimental work, while teachers in mathematics do this during problem solving lessons. In general however, a lot of time is still spent “listening” to the teacher.

This is an indication (subject to discussion) that traditional instructional teaching still is the dominant methodology being used by teachers.

SCIENCE

Science’ curricula as part of MST

Science (meaning natural sciences: biology, chemistry and physics, integrated or not) was also studied as part of the research.

It is remarkable how different systems and curricula are from country to country. The table below gives the names of the courses for 8, 11 and 13 year old learners. Kindergarten is not mentioned here since the situation is very specific to each country: some countries consider the 5 year olds as attending school (obligatory), with developmental goals written in integrated curricula, while in some countries 5 year olds are taken to nursing organisations, with care as the focus rather than learning.

8 years old	Mathematics	All countries
	Science integrated	Belgium, Germany, Italy, Poland, Sweden, the Netherlands, the United Kingdom
	Technology	Belgium, Italy, Sweden, the Netherlands, the United Kingdom also including: Austria - technical crafts, Poland: technics
	Science and Technology	Cyprus
	Environmental Education	Cyprus, Slovenia also including: Austria - social and environmental studies
	Geography	Cyprus
11 years old	Mathematics	All countries
	Science integrated	Belgium, Italy, Poland, Sweden, the Netherlands, the United Kingdom
	Technology	Belgium, Cyprus, Italy, Sweden, the Netherlands, the United Kingdom also including: Austria - technical crafts, Germany - technics/computer, Poland - technics, Slovenia - technics and technology
	Science with additional science subject(s)	Cyprus, Slovenia
	Environmental Education	Cyprus
	Geography	Cyprus
	Biology	Austria, Germany
	Physics	Austria, Germany
13 years old	Mathematics	All countries
	Science integrated	Belgium, Italy, the Netherlands
	Technology	Belgium, Cyprus, Sweden, the Netherlands, the United Kingdom. also including: Austria - technical crafts, Germany - computer science, Italy - technics and technology, Poland - technics, Slovenia - technics and technology
	Science with additional science subject(s)	United Kingdom
	Geography	Cyprus, Poland, Slovenia
	Biology	Austria, Germany, Poland, Slovenia, Sweden, the United Kingdom

	Physics	Austria, Cyprus, Germany, Poland, Slovenia, Sweden, the United Kingdom
	Chemistry	Austria, Cyprus, Germany, Poland, Slovenia, Sweden, the United Kingdom

Table 5: MST curricula for ages 8, 11 and 13 in 10 countries in Europe.

SECURE provides a comparative study between all these curricula in all 10 countries, based on the spider web components.

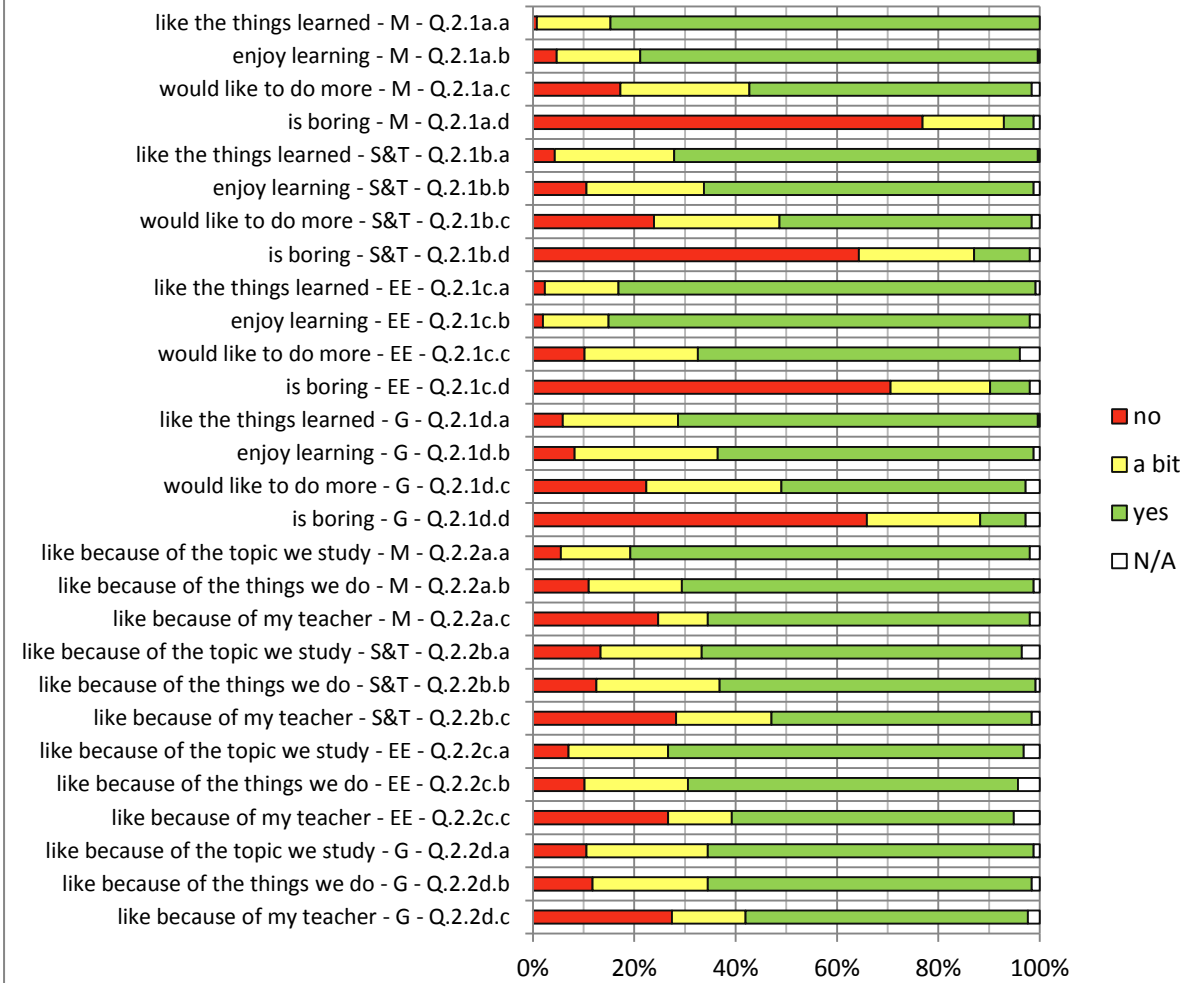
‘Science’ in questionnaires

Motivation or interests in science was raised within SECURE as an extra topic to study, complementary to the spider web items.

Many results from other studies are confirmed, like the decreasing interest in the sciences in general, although there are exceptions. In addition, the study found that teachers that prefer science subjects do not seem to attend continuing professional development courses, while at the same time they regard sciences as very important disciplines in relation to societal needs.

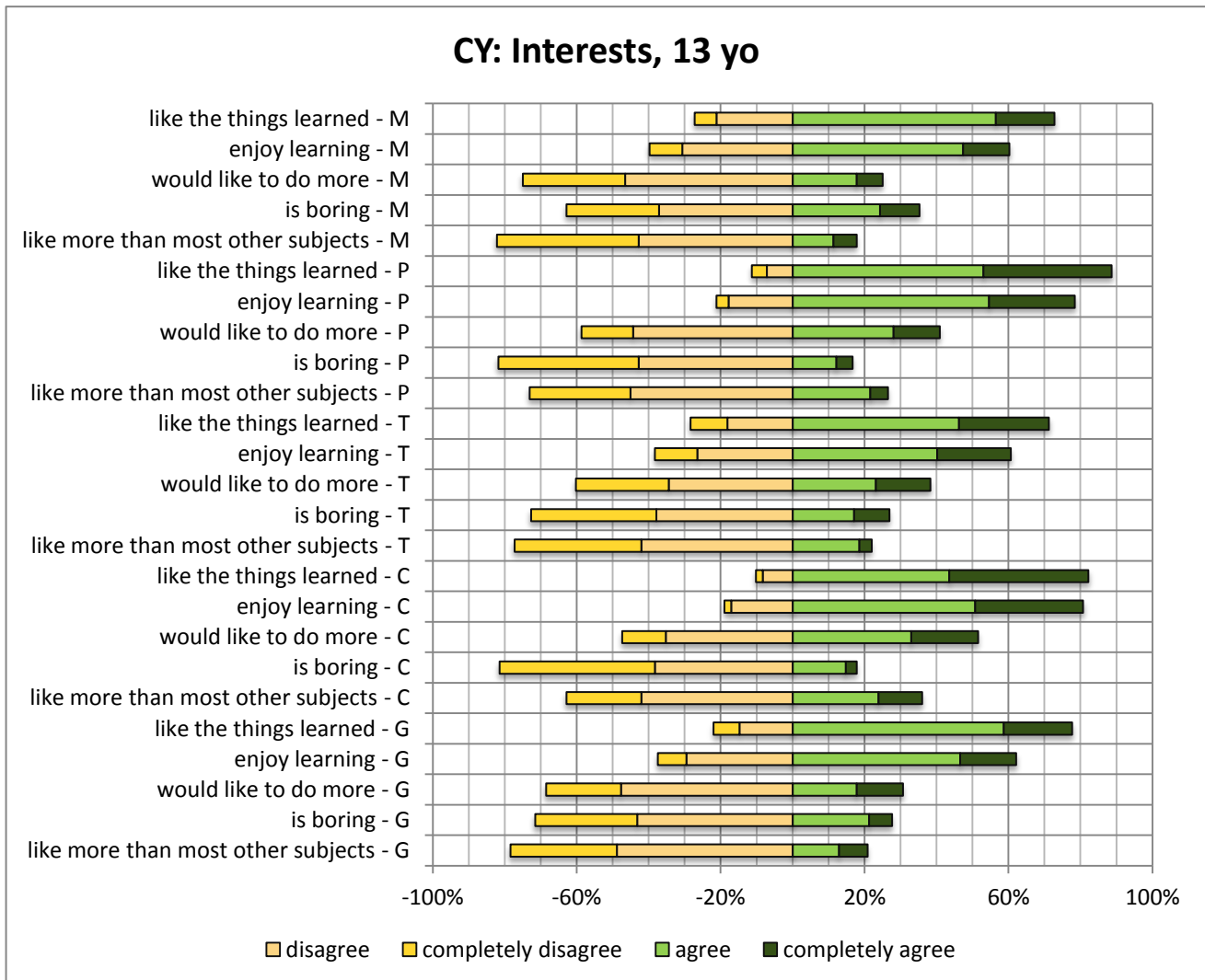
SECURE researchers asked for feedback from the learners on several items:

CY, 8yo: Interests



Graph 5: 8 year old learners' interest (N= 255) in different courses in Cyprus. The table indicates Mathematics (M), Science and Technology (S&T), Environmental Education (EE) and Geography (G)

8 year old learners could answer with “no”, “a bit” or “yes”, while 11 and 13 year old learners needed to answer with “(dis)agree” or “(dis)agree completely”. This causes a slight difficulty in comparing



Graph 6: 13 year old learners’ (N=264) interest in topics Maths, Physics, Technology, Chemistry and Geography in Cyprus

Comparison of these answers across the ages can give an indication of increasing/decreasing interest for certain disciplines. Selecting the question “I would like to do more” as an indicator for interest gives information regarding three more countries, Austria (AT), Belgium (BE) and Italy (IT):

	“Would like to do more”	M	S	T
AT	8 year olds AT “yes” (%)	25	43	73
	11 year olds AT “Agree/completely agree” %	18	28 (average of B/C/P)	34
	13 year olds AT “Agree/completely agree” %	20	42 (average of B/P) ³	47
BE	8 year olds BE “yes” (%)	28	46	54
	11 year olds BE “Agree/completely agree” %	20	49	56
	13 year olds BE	30	48	54
IT	8 year olds IT “yes” (%)	40	55	68
	11 year olds IT “Agree/completely agree” %	40	55	42
	13 year olds IT “Agree/completely agree” %	22	39	29

Table 6: Learners of ages 8,11 and 13 that “Would like to do more” of the topics mathematics (M), Science (S;) and technology (T) in Austria (AT), Belgium (BE) and Italy (IT).

Conclusions are difficult to draw however. Having mathematics a considerable number of hours, learners, despite possible interesting lessons, might not want to have more. On the other hand, we can conclude that learners would like to have more technology. For science the opinions are more or less equally spread between agree on more or disagree on more.

ENVIRONMENTAL

‘Environmental’ in Curricula

As far as content is concerned, SECURE comes to the following preliminary conclusions.

Sustainability as well as societal and environmental problems in general, is addressed in the MST curricula all over Europe. Societal and environmental issues are relevant for all ages. For example pupils learn about the production as well as the separation of waste or garbage in everyday life which they have to take care of (Slovenia (SI), Belgium (BE), Poland (PL)), whereas another goal is that pupils become aware of the need for sustainable development and understand their own and societal responsibility for the future of ecosystems and biosphere and the use of chemicals (SI). In some countries, sustainability is a general part of the curriculum (Austria (AT), Belgium (BE), Germany (GE), Slovenia (SI)). Sustainability is mentioned in terms of taking care of the environment (Netherlands (NL)) or nature (Belgium (BE)); it supports the development of a positive attitude towards actions on environmental issues (Cyprus (CY)) or the opportunity to take responsibility for the environment in areas where pupils themselves can influence directly (Sweden (SE)). There are also links to sustainability in the science and technology curriculum (United Kingdom (UK)).

³ Where the sciences are not integrated, for 13 year olds, we take the average of the percentages of biology (B), chemistry (C) and physics (P).

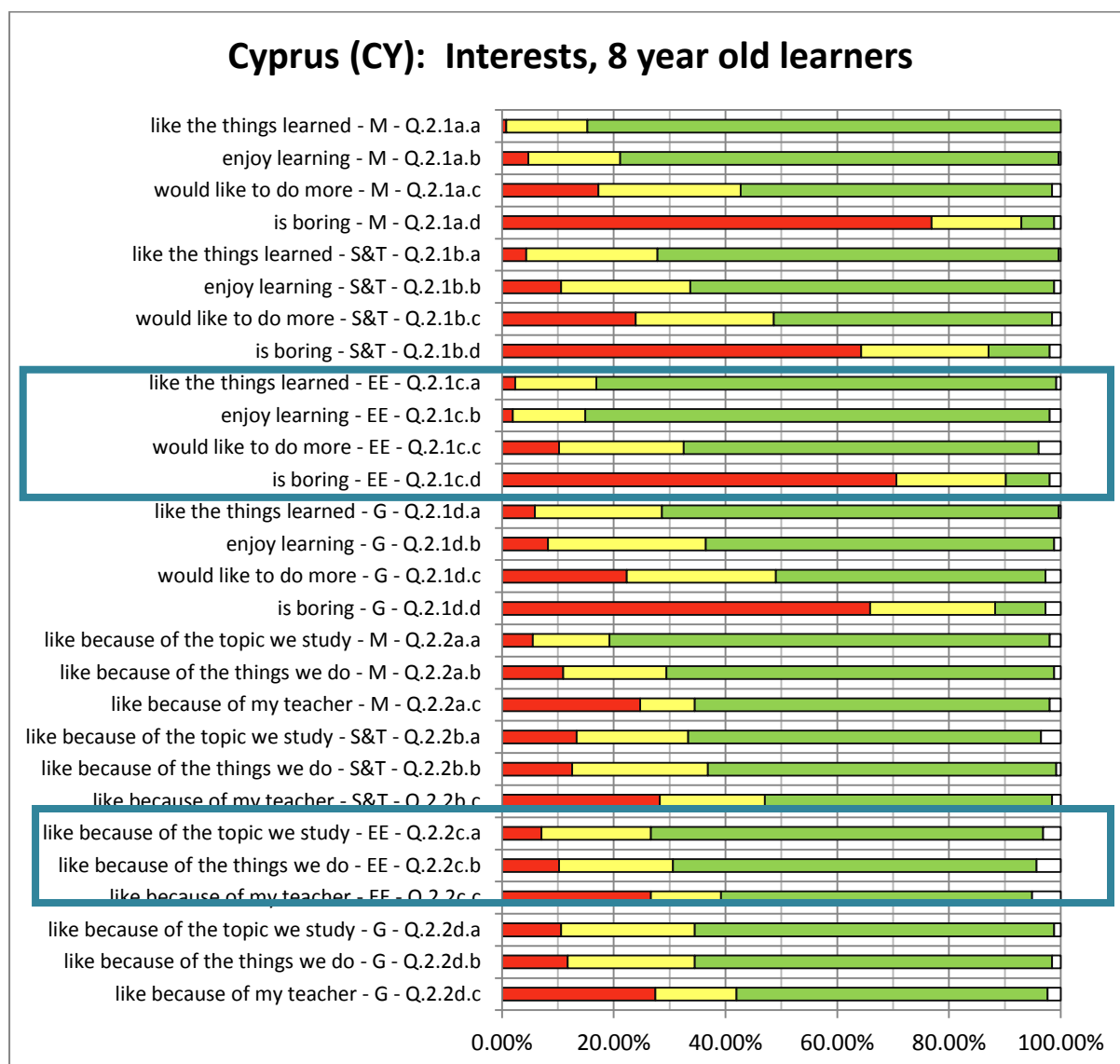
Environment and sustainability as topics need to be implemented in an explicit way by the MST teachers of all ages.

In general little specific attention goes to environmental issues in the curricula of the ten countries of SECURE. On the other hand, in Cyprus, a lot of attention is paid to it, and there is even a specific course for 8 and 11 year olds established to address this issue. Also in Austria a specific course for 8 year-old learners exists, as well as in Slovenia where the course “Environmental Education” is obligatory for 11 year-old learners.

‘Environmental’ in questionnaires

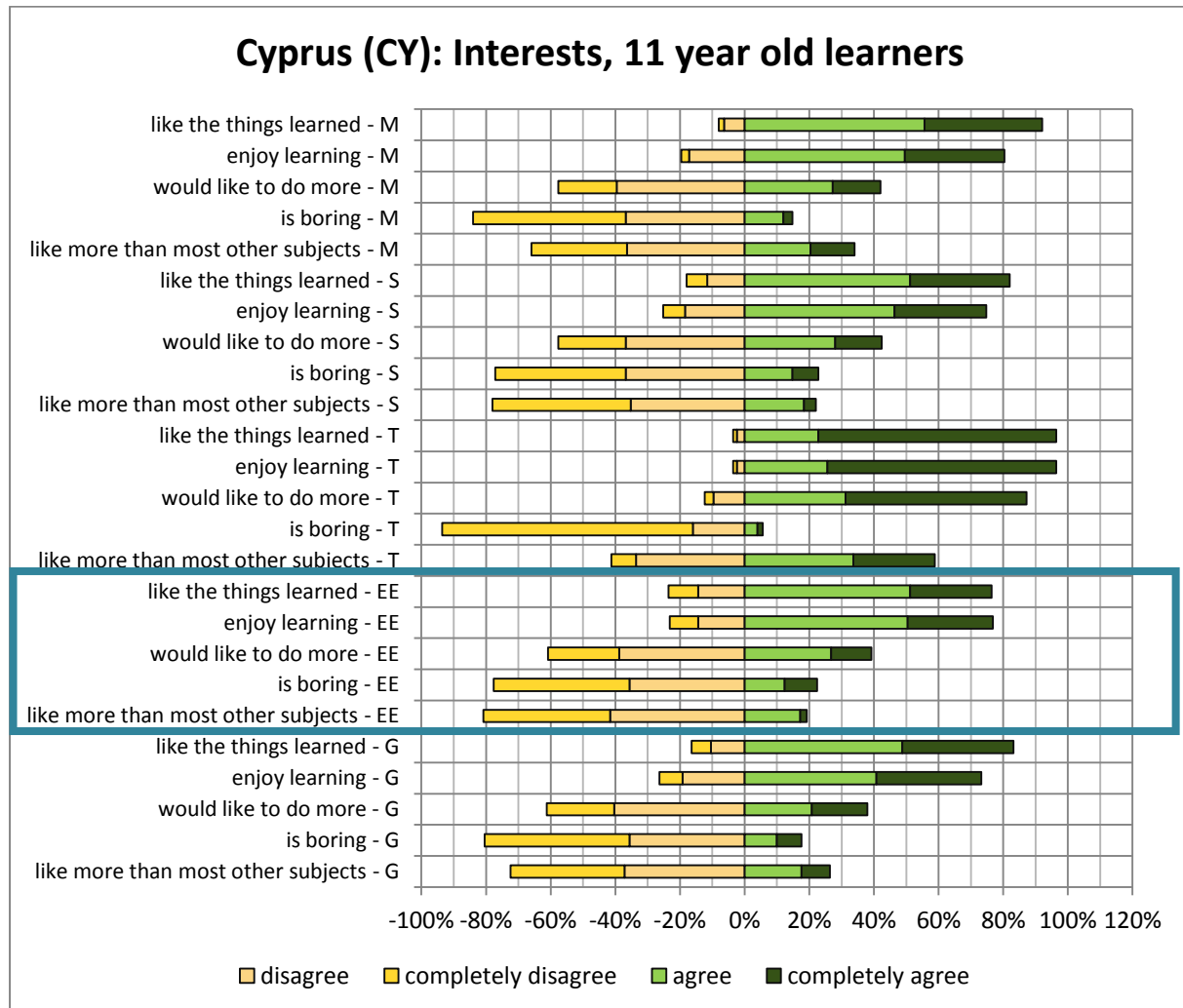
How do learners perceive the Environmental Education (EE) course?

The table shows that in Cyprus, which has an explicit course in environmental education for 8 year-old learners, EE scores very well:



Graph 7 shows how 8 year-old learners perceive the EE and other courses (N= 255)
 (Legend: left “no”, middle “a bit”, right “yes”)

Also in Cyprus, the study found the following information for 11 year-old learners:



Graph 8: 11 yo learners’ interest in EE and other topics in Cyprus (N=250)

The EE course scores as popular as the others. The result for Technics is remarkable, having a significant more positive score.

“Environmental” in interviews

In the SECURE interview summary report the word “environmental” does not appear. The interview guide questions did not go into detail on the content of the curricula. The topic “environmental” was raised explicitly by the researchers. On the other hand, teachers and learners rarely raised this topic during interviews. In Sweden some teachers of 11 year olds mentioned environmental issues; in the Netherlands only one experienced teacher mentioned the topic of the environment and in Belgium teachers stated that science subjects were useful for solving environmental problems.

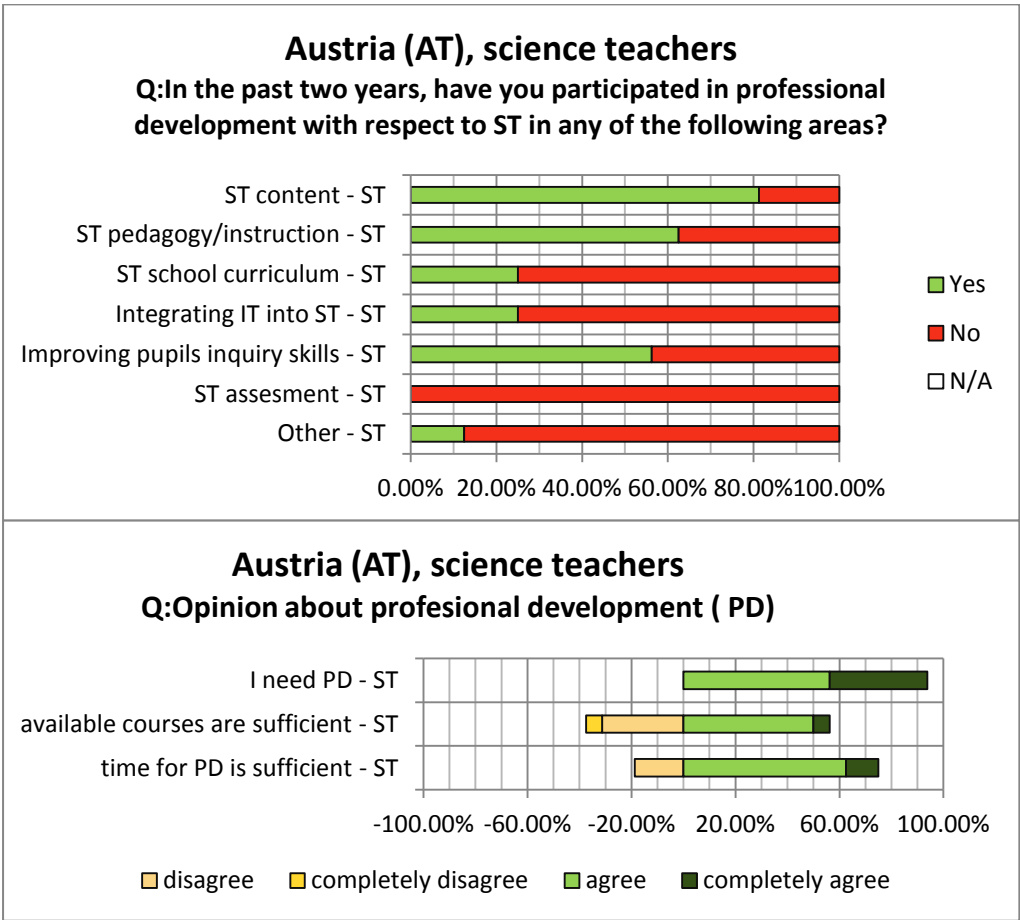
Conclusion:

The respondents to the questionnaires do not raise the topic of the environment as a significant issue and teachers are more likely to teach about environmental issues in an implicit rather than an explicit way.

MEETING THE CHALLENGES OF A GLOBALISED WORLD

Focusing further on the conference themes, and to know to what extent teachers are updating their knowledge, attitudes to continuing professional development can be ascertained from the answers given by teachers in response to the following question: “In the past two years, have you participated in professional development with respect to science/technology in any of the following areas?” From data given by the integrated science teachers⁴ we can conclude that, except for Austria, in all other nine countries the majority of teachers have not attended any professional development course in science and technology, mathematics, improving learners’ inquiry skills, nor in assessment of MST in the past two years. These responses link to the three following questions “Do you need professional development? Are courses available? Do you have time for that?” The findings of the study indicate that there is a need for continuing professional development of MST teachers and that a large majority of the teachers say they need it, and that they know of courses that are available. However, a significant number of teachers (except Austria 19%) state they do not have time to attend these extra courses: in Poland 46%, Slovenia 52%, Belgium 59%, Cyprus 63%, Sweden 65%, Italy, 66% and in the UK this is 78%.

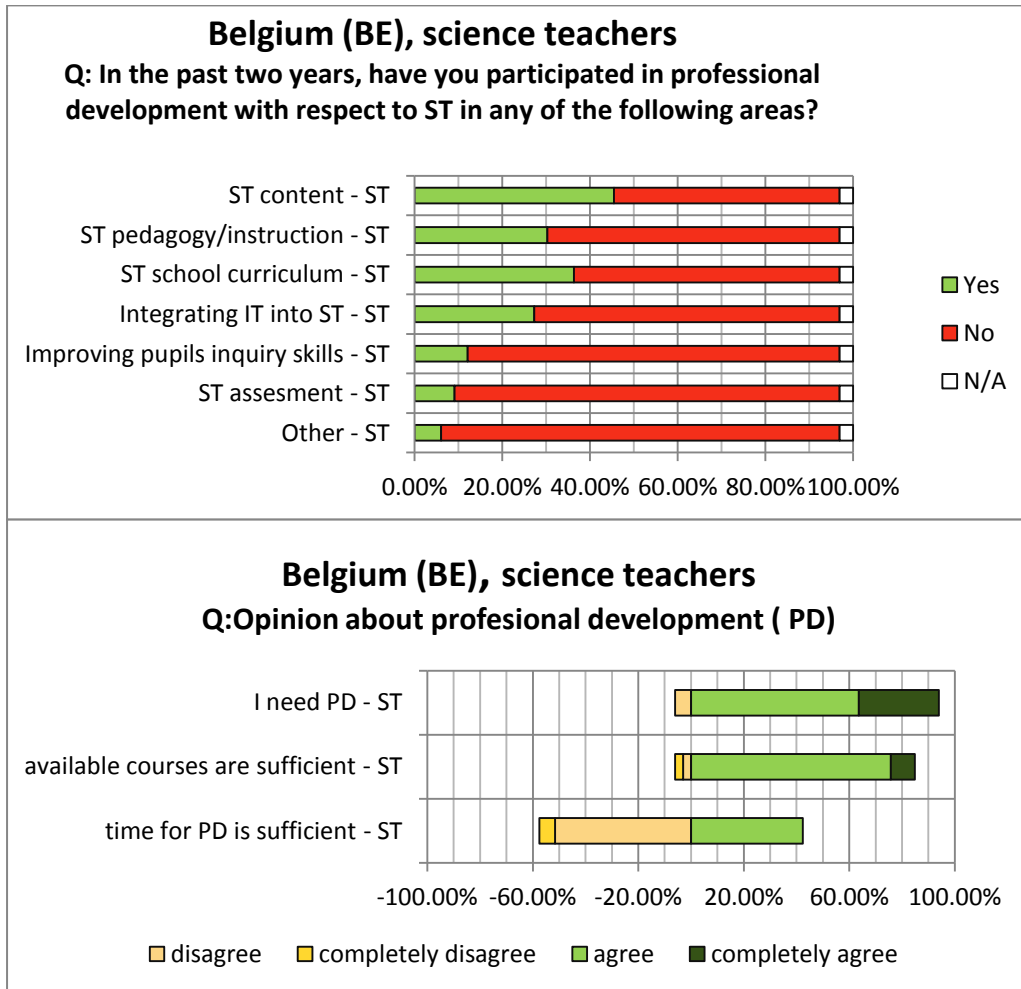
⁴ Integrated science teachers teach an integrated science course (mostly ages 5, 8 and 11), while specific science teachers teach separate specific disciplines.



Graph 9 Austrian science teachers’ opinion on professional development. (N=62)

The data above is exceptional compared to the other countries of SECURE.

Most graphs look like the Belgian ones:



Graph 10 Belgian science teachers’ opinion on professional development. (N=72)

A certain tension becomes visible when looking at another question, concerning the future of science education, e.g. “Is science and technology important for the pupils’ further education?”. The percentages of integrated science teachers answering with “agree” or “completely agree” were 100% in Austria, Slovenia, Italy and Poland, 97% in Cyprus, 95% in Sweden, and 91% in Belgium.

Looking at the questions “Is S/T socially relevant” and “Most of the pupils know the importance of S/T”. The integrated science teachers’ answers are outlined in the table that follows:

Answer “Agree + completely agree”	AT	BE	IT	SE	SL	UK
Q: “Is S/T social relevant?”	88	64	97	100	100	85
Q: “Most of the pupils know importance of S/T”	69	64	87	75	60	85

Table 8: Teachers’ opinions about the question “Is S/T socially relevant” and “Most of the pupils know the importance of S/T” in six countries.

Teachers teaching specific courses only are not included in this table. Even though these results are based on a limited number of teacher responses, the answers highlight that teachers are aware of the general importance of science and technology education. However, since the responses indicate that teachers have little time to pursue continuing professional development courses (CPD), it makes it difficult to ensure that teachers are up to date regarding the curriculum content.

CONCLUSIONS

The SECURE project provides a lot of data on mathematics, science and technology curricula and their implementation into everyday school practice that may be useful for different groups of stakeholders. This data makes it possible to look at curricula, perceptions of teachers and students from a wide set of perspectives.

The concept of social justice and development of social skills are regarded as very important both in education in general and within the science subjects. This is reflected both on the level of curriculum as well as within the answers in questionnaires on perceptions of teachers and learners.

Mathematics, science and technology education as such can be very motivating and interesting for learners, although the research shows that the level of motivation tends to decrease with age. Some countries do significantly better than others. Technology is regarded as more motivating than other “science” courses for learners.

Finally, teachers do realize that continuing professional development is absolutely necessary and that they do need to undertake further professional training. However, due to time constraints they are unable to attend many courses.

Acknowledgements

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SECURE documents used:

“Mapping national curricula for maths, science and technology in EU countries”

Intermediate analysis (drafts) on questionnaires for 8, 11 and 13 years old and for Integrated Science teachers.

“SECURE Summary Interview Report Draft 28052013

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Making Development Issues Accessible through Picturebooks

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ABSTRACT

Within the theme of migration, there has been a significant increase in children's literature which deals with the issue of seeking asylum in a foreign country (Hope, 2008). Starting from the premise that access to such literature is important for both refugee children and indigenous children, this paper presents the potential of teaching the topic of refugees through picturebooks. The picturebooks allow teachers to develop the traditional forms of literacy i.e. reading and writing. However, the multidimensional representation of refugees also allows teachers to develop critical literacies in the classroom. This paper draws on a data from a larger research project (Dolan, forthcoming) which aims to provide student teachers and primary teachers with a comprehensive choice of picture story books to use for teaching development/intercultural education and education for sustainability. In this paper, I discuss the experience of seeking refuge as an important development education concept. A range of picturebooks about refugees are explored along with important definitions. Finally, I outline a number of common themes which emerge from these picturebooks.

INTRODUCTION

Migration can be defined as the movement of people from one place to another. This complex geographical theme provides us with an analysis of the territory of departure as well as the territory of origin of migrants in terms of settlement, economic activities and cultural integration or lack thereof. There are a variety of *push and pull* factors amongst the reasons for migration. *Push* factors are those in the country of origin which forces the migrant to leave including civil war or poverty. *Pull* factors are those in the new country which are considered attractive by the migrant e.g. peace and security. The theme of migration is becoming increasingly important for primary school children as they face this issue through meeting new children from different ethnic backgrounds and geographical places.

Picturebooks provide teachers and children with a unique opportunity to explore this complex issue in an age appropriate manner for children.

Ireland is an island nation on the western seaboard of Europe. Its history, culture and identity have been shaped by immigration and emigration over the centuries. Today thousands of Irish people are emigrating due to the financial recession currently being endured by the country. The vast majority of Irish emigrants are heading to English speaking countries such as Britain, Canada, Australia, US and New Zealand. Throughout the period of economic growth

known as the Celtic tiger years, high numbers of immigrants travelled to Ireland. As a result 10% of children in primary schools today are from different ethnic backgrounds. Of course the Great Irish famine of the 1840s still provides the grand narrative in terms of epic emigration stories which continue to be celebrated around the world today.

Annie Moore was the first immigrant to be processed through Ellis Island, New York, on January 1, 1892, her fifteenth birthday. She and her two brothers travelled to America to be reunited with their parents Michael and Mary Moore in New York City. Several years later the Moore family settled in Indiana. Annie Moore is memorialized by bronze statues in New York Harbour and Ireland and cited in story and song as the first of 12 million immigrants to arrive at Ellis Island. Her story is presented in picturebook format *Dreaming of America: An Ellis Island Story* (Bunting, 2000). Bunting herself an emigrant from Ireland grew up in a tradition steeped in the art of storytelling and the magic of words. Migration features prominently in her work e.g. *How Many Days to America? A Thanksgiving Story*, (1990); *So Far from the Sea* (2009) and *A Picnic in October* (2004).

Within the theme of migration, there has been a significant increase in children's literature which deals with the issue of seeking asylum in a foreign country (Hope, 2008). Refugees are defined according to the 1951 United Nations Refugee Convention as those who have fled their country and are unable to return due to a "well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group, or political opinion." An asylum seeker is someone who is seeking protection but whose claim for refugee status has not yet been assessed. While it is important for asylum seekers and refugees to see their stories feature in classrooms, it is also important for indigenous children to hear these stories and to learn about the experiences of other children. These stories are important for showing that refugee children are ordinary children in extraordinary circumstances (Hope, 2008). Without access to these stories, it is difficult to expect children to understand the experiences and lives of refugees.

In Ireland the Department of Education and Skills has produced a strategy for the promotion of literacy and numeracy (DES 2011) following recent reports of reduced literacy standards amongst young people. However, it remains to be seen if literacy and numeracy will be defined in narrow, exclusive or broad terms. Several commentators such as Comber (2001) argue that simple conceptions of "literacy", so much promoted today, are inadequate. Comber argues that being critically literate is not only central, but is essential for being literate in a

media saturated, diverse world. Children today experience a constant stream of ideas and information online, in print and through electronic games and mass media. Therefore the term *literacy* in the 21st century is changing and will continue to do so.

Emergent research on literacy highlights the imaginative, interpretative, non-linear, interactive, dynamic, visual and mobile features of communication (Coiro, Knobel, Lankshear and Leu, 2008). Although these interactive features of text are evident in many educational technologies such as computers or interactive white boards, they are also present in recently published children's books. Many books are now available as e readers and some are accompanied with innovative apps for more intensive and creative engagement.

This paper presents the potential of teaching the topic of refugees through picturebooks. The picturebooks allow teachers to develop the traditional forms of literacy i.e. reading and writing. However, the multidimensional representation of refugees also allows teachers to development critical literacies in the classroom. This paper draws on a data from a larger research project (Dolan, forthcoming) which aims to provide student teachers and primary teachers with a comprehensive choice of picture story books to use for teaching development/intercultural education and education for sustainability. In this paper, I discuss the experience of seeking refuge as an important development education concept. A range of picturebooks about refugees are explored along with important definitions. Finally, I outline a number of common themes which emerge from these picturebooks.

CURRENT CONTEXT

There are a number of factors which obstruct the effective use of picturebooks in primary classrooms.

Teacher Knowledge: According to Morris and Coughlan (2005,10) 'whether you and your children, or the children you work with, live in the multicultural inner city or in the heart of the countryside, the talk, investigation and activity that can be engendered by fine picturebooks will lay good foundations for the development of informed and positive attitudes to racial identity, the child's own and that of other groups in our society'. Children learn so much about the world they live in through the books they read, but sometimes they are presented with a limited selection by teachers which are chosen on the basis of their own world view.

While there are a range of excellent picturebooks available for teaching a broad range of social themes including the geographical theme of migration, these books are often not found in primary classrooms. Unfortunately, many primary teachers feel less than confident in their ability to select contemporary literature for children and tend to rely on the books they enjoyed as children. In a survey of 1,200 teachers, the United Kingdom Literacy Agency (UKLA) found there was evidence that teachers relied on a narrow repertoire of children's authors, and in particular had a very limited selection of poetry and picture fiction (Cremin et al. 2008).

'Picturebooks are only for young children': Picturebooks feature in all pre-school and early childhood classrooms. While often associated exclusively with younger children, several picturebooks have been written for older children, adolescents and in some cases, adults. Nevertheless many teachers still perceive picturebooks as the jurisdiction of the early years' classroom (Key Stage One). It could be argued that picturebooks are even more effective in promoting creativity with older children. Nonetheless, they tend to be used less with older children as other literary forms e.g. the novel, take centre stage.

Stronger focus on the text rather than on the illustrations: A picture book is a work of art and the strength of the picturebooks lies in the interrelationship between pictures and text. However, many teachers tend to focus on 'reading the text' to the point of excluding the illustrations. The influence of the teacher is paramount in guiding the means through which the child interacts with the picture book. Arizpe and Styles (2003:249) underline the importance of teaching children to deconstruct pictures. Their research confirms that 'children can become more visually literate and operate at a much higher level if they are taught how to look'. Hence, the challenge for the primary teacher is to interrogate images from picture story books in a manner which promotes enquiry based learning, creative thinking and develops skills of critical visual literacy. Also when picturebooks are used in primary classrooms they tend to be restricted to literacy hour and interrogated in very superficial terms.

PERSPECTIVES OR THEORETICAL FRAMEWORK

The epistemological assumption that underpinned this research is informed by Freirean notions of critical literacies and more recent writing about multiliteracies (New London Group, 1996). Ongoing academic and social debates that have taken a critical perspective on the nature of literacy have challenged thinking about what it means to be literate (Baynham

and Prinsloo, 2001; Gee, 1996). Scholars working in the field of Literacy Studies (Freire and Macedo, 1987) and New Literacy Studies (Barton, Hamilton and Ivanic, 2000), multilingual literacies (Blackledge, 2000) and critical literacies (Cummins, 2001) have problematized the very notion of literacy as a discrete set of skills, reframing literacy as a set of socially and culturally constituted practices enacted across and within social and institutional spaces. Research across these fields has demonstrated the disjuncture between literacy valued in schools and the peripheral position of multilingual, multicultural and global literacies. Research on multiliteracies (New London Group, 1996) further highlights the importance of creating learning environments to engage students in a wide range of literacy practices that are creative and cognitively challenging and that bring together text-based and multimedia forms of meaning making.

Critical literacy has been traced to the work of Paulo Freire who taught adult learners to 'read the word' in order to 'read the world' and to engage in a cycle of reflection and action (Freire and Macedo 1987). According to Wolk (2003:102) critical literacy is 'about how we see and interact with the world; it is about having as a regular part of one's life, the skills and desire to evaluate society and the world'. That critique is especially focused on issues of power: who has it and who is denied it: how it is used and how it is abused. More specifically, that critique often revolves around issues of race, culture, class, gender, media and the environment in the hope of creating a more just, humane democratic and equal world. Critical literacy is the ability to read text in an active and reflective manner which promotes a deeper understanding of socially constructed concepts, such as power, inequality, and injustice in human relationships. The development of critical literacy skills enables people to interpret messages in the modern world through a critical lens and challenge the power relations within those messages. Early childhood educators who facilitate the development of critical literacy encourage children to interrogate societal issues such as poverty, education, and equality and institutions such as family and school in order to critique the structures that serve as norms as well as to demonstrate how these norms are not experienced by all members of society. Critical literacy is not merely about educating children in critical ways of seeing and questioning. It is equally about encouraging what Maxine Greene (1995:5) calls their 'social imagination' which is 'the capacity to invent visions of what should be and what might be in our deficient society, on the street and in our schools'. Children's literature, including picture books, provide endless opportunities for teaching critical literacy and for incorporating global and justice perspectives in the classroom.

REFUGEES: AN IMPORTANT DEVELOPMENT EDUCATION AND INTERCULTURAL TOPIC

Today there are refugees in countries all over the world. Many people are not able to avail of the protection of their state and therefore require the protection of the global community.

There are more than 15 million refugees in the world today:

- 80 per cent live in developing countries.
- More than half live in urban areas and less than a third live in camps.
- In 2009, almost 1 million asylum seekers asked for refugee status worldwide.
- 47 per cent of refugees and asylum seekers are women and girls.

Source: UN Refugee Agency

Refugees are a reminder of the failure of societies to exist in peace and our responsibility to help those forced to flee. Flight often follows human rights abuses and violations as well as various forms of social breakdown, including war. These issues are linked to concepts such as justice, equality, tolerance, freedom and minority rights. Refugee and asylum seeker issues are constantly in the media, yet many people are unaware the reasons why people seek refuge in a new country. Sometimes, the media misrepresents migrants, refugees and asylum seekers, creating stereotypes and fuelling myths and misunderstandings. At a time where one in every 100 people in the world has been forced to flee persecution, violence or war, it is important for all citizens, including children, to understand the complex issue of seeking refuge. Sometimes it is difficult for children to fully comprehend refugee issues.

The UN Refugee Convention otherwise known as the Geneva Convention is an international human rights treaty that was drafted in 1951. It was created to provide rights to millions of people displaced as a result of war in Europe. The Convention defines a refugee, outlines the rights of refugees and explains what governments should do to protect refugees in their territory. In countries that have not signed the Refugee Convention, the UN Refugee Agency (UNHCR) is responsible for protecting refugees and, where possible, arranging for them to either safely return home, integrate into society or be resettled in another country. The Universal Declaration of Human Rights' Article 14 states that everyone has the right to seek asylum from persecution.

Over the past 60 years, the Refugee Convention and the countries that have signed it have protected millions of people. The Convention and the accompanying UNHCR guidelines are

not always followed but when they are, people can be protected, crises can be averted and the world can be a slightly better place.

REFUGEES AND PICTUREBOOKS

Picturebooks about refugees and asylum seekers address a range of universal emotions including fear, grief and confusion. Several books pay homage to the resilience of children placed in difficult situations. These books provide ideal teaching opportunities for exploring issues such as compassion, empathy, tolerance, justice, conflict resolution and a respect for human rights. The reasons why asylum seekers seek refuge are often misunderstood. Many people do not realise how much asylum seekers and especially children, have been through.

Mary Hoffman's *The Colour of Home* (2002) tells in simple language the story of Hassan, a refugee from Somalia who has witnessed things no child should ever see. When he arrives in England everything is so different and it is very difficult for him to respond to friendliness from his new classmates. His imaginative teacher invites him to paint a picture. Hassan is finally able to communicate his experiences in Somalia when his home was burnt and his uncle shot. Slowly, through the picture, his teacher and classmates begin to understand his story and why he must try to build a new life a long way from home. The clever use of colour - bright and happy for his home, red and black for anger and war, various tones of grey for his sadness and loss - explains Hassan's moods and feelings where words would fail us. Towards the end of the story, colour and hope begins to return to Hassan's life.

Another perspective on asylum seekers is provided by Ben Morley. His book *The Silence Seeker* (2009) tells the story of Joe and his quest to find a quiet place for his new neighbour, who is an asylum seeker, according to Joe's mother. Joe misunderstands and thinks the boy is *a silence seeker* especially when Mum adds that he needs peace and quiet. The story shows friendship developing between the two boys, but it also makes Joe realise that he can't find a peaceful and quiet place for his friend and readers are introduced to the threats and tensions which lie in their environment.

Endorsed by Amnesty International, UK, *Azzi In Between* (2012) was written by Sarah Garland after spending time with refugees in New Zealand. Told from a child's perspective, *Azzi in Between* is a sensitive story about Azzi and her family who are forced to flee their country to survive. Presented in a graphic format, this picturebook is suitable for children from 8 years onwards. Its central message about the plight of refugees is also informative for adolescents and adults.

The cover image for *Azzi In Between*, shows a little girl clutching her teddy bear as she looks cautiously behind her while walking through a war torn landscape. This sets the scene for what is to come, as Azzi and her family, flee their unspecified Middle Eastern country and arrive as refugees in the Western city that will gradually become their home. War is depicted in shades of grey that contrast with the bright colours in Azzi's home life. The impact of the war on the family gradually erupts and Azzi's father, a doctor, receives a phone call warning the family they must leave. There follows the hurried departure, a terrifying journey and the bewildering newness of everything at their destination: including food, language and school. Azzi also desperately misses her grandmother who has stayed behind, and worries that she may never see her again.

Azzi's parents manage to shield her from the brunt of their worries, as revealed by the shadows under Mother's eyes, and the fact that Father is too tired when he comes home in the evening to share the new words he has learned that day. There are many nuanced messages in the book for more mature readers. When Azzi ask her father if he is now happy, he responds "I think you are making me happier, Azzi." This conversation provides inspiration for further interrogation in the classroom.

In terms of non-fiction *Why are people refugees?* (Senker, 2007) explains the differences between being a refugee, an internally displaced person and an economic migrant. Readers can find out about the experience of being forced from home and understand how many people in the world are treated in this way. The author uses illuminating statistics to summarize the plight of individuals in various geographic areas and times. Issues such as war, natural disasters, abuse of human rights, and economics are discussed as causative factors. Case studies quoting refugees create additional impact. Colour and black and white photographs amplify the nature of the circumstances of those affected.

The metaphorical portrayal of refugees in picturebooks

Hans Christian Anderson's story *The Ugly Duckling* can be interpreted as a metaphor about a refugee swan in a pond of ducks. Like refugees everywhere the swan is different. He is ridiculed, shunned, excluded and bullied. When he becomes a swan even the ducks can see his beauty. Telling stories using metaphors can be powerful and honest. David Miller's book *Refugees* (2005) relates the adventures of a pair of wild blue billed ducks whose home is destroyed when their swamp is dug up and they have to find a safe place to live. The difficult and dangerous journey they undertake seems doomed to failure. They try unsuccessfully to

settle in different environments, including an ocean, a busy river port and a swamp where duck shooting is allowed. They are close to exhaustion when the intervention of an unknown person changes their fate. David Miller's colourful and highly detailed paper sculptures add a three dimensional quality to the story that captures the readers' interest and expands on the text. The scenes are presented from different perspectives that draw the viewer into the world as the ducks see it. Although the language and illustrations in the book are easy for young readers to engage with, there are hidden depths to intrigue and challenge older readers.

The Island (2007) presents an interesting perspective on refugees or visitors to a new place. A lone man is washed up on the shores of a remote and fortress like island. The Islanders response to the stranger is at first grudgingly accommodating though not kind. Soon the irrational fear of the stranger/other, leads the islanders to send the man back to sea. The black and white illustrations appropriately accompany this frightening and partially symbolic depiction of the treatment of refugees. This book is a metaphorical account of the way in which prejudice and fear create artificial barriers between people, which they use to exclude others in order to protect themselves. It offers reasons why refugees exist and why detention centres and refugee camps have become so prevalent throughout the world.

EMERGENT THEMES FROM PICTURE BOOKS

In picturebooks about refugees, a number of themes emerge: personal testimonies; loss and loneliness; identity; resilience; the journey; upheaval and chaos during departure; the process of settling into a new country; challenges, experiences in a new country; and important artefacts.

Personal testimonies:

In an effort to give a voice to refugee children, Anthony Robinson and Annemarie Young have written a series of excellent '*Refugee Diary*' (2009) books based on the real life experiences of four children. The books follow the journeys undertaken by Gervelie, escaping from the war in the Republic of Congo, Hamzat who steps on a landmine in Chechnya, Mohammad an Iraqi Kurd who saw his parents beaten and Meltem from Eastern Turkey who experiences racism as he waits to find out if he can stay in Britain. The books are supported by real photographs and sensitive illustrations.

Anh Do is a well-known Australian comedian and the author of *The Happiest Refugee: A memoir* (2011) and the subsequent picturebook *The Little Refugee* (2011). As a toddler his family travelled to Australia, as boat people after the Vietnam War. The story in his picturebook is told from the perspective of the author who states:

Giant waves crashed down on our little boat. I was terrified but my mum hugged me tight and told me, "Everything will be okay. Don't worry, it will be okay".

In the aftermath of the Vietnam War and childhood poverty, Anh, his family and their friends flee from their country on a fishing vessel. They battle heat, storms, hunger, thirst, attack, loneliness and fear before they find a safe haven in a new country, and a new life in Australia. But there they are forced to adapt and to learn new skills in order to survive.

Life can be difficult for a small Vietnamese boy with no English and funny lunches, and parents who have to work all the time to make ends meet. In his book the earlier part of his life including the war and the dangerous journey in a smelly boat are illustrated in sombre tones. The arrival of the Do family in Australia is signified by a change to vibrant colour. Even though life is difficult and there are significant obstacles to overcome, including poverty and the challenge of settling into a new school with a new language, the book is marked by optimism and hope.

In *Mali Under the Night Sky, A Lao Story of Home* (2010) Yourne Landowne tells the true story of artist Mali Jai Dee whose family was forced to flee Laos when she was five. Before the war began, Mali lived an idyllic life in a community where she felt safe and was much loved. She loved to sit in front of her house and ask everyone who passed by, 'Where are you going?' She herself went everywhere too, climbing on the flowering trees, catching tiny fish in a rice field, looking for pale bamboo shoots in the dark forest. Mali's idyllic life is shattered when war encroaches, driving her and her family through a dangerous journey across the Mekong River. The family lands 'in the worst place [Mali] had ever been, a crowded jail'. In spite of war and imprisonment Mali 'grew up to be an artist and an activist so that all people may celebrate their own creativity even in the most difficult situations'. Mali's story reveals the strength of family and culture to carry a child through unthinkable hardship.

Loss/Loneliness:

Loss and loneliness are important themes which feature in several picturebooks about refugees. As this is an emotive and challenging theme for teachers and children, it is perhaps advisable to discuss this theme initially in abstract terms. Many well-known, picturebooks deal with the issue of loss and loneliness. There have been several picturebooks versions of the Hans Christian Anderson classic *The Little Mermaid* (Andersen et al. 2011). In this story the little mermaid gave up her sea world, her family, even her voice to move to an unfamiliar place.

Oliver Jeffers *Lost and Found* (2006) offers a different perspective on being lost. This book features a boy who has to deal with the sudden arrival of a penguin on his doorstep. The boy decides the penguin must be lost and tries to return him. But no one seems to be missing a penguin. So the boy decides to take the penguin home himself, and they set out in his rowing boat on a journey to the South Pole. But when they get there, the boy discovers that maybe home wasn't what the penguins was looking for after all.

Refugees have to leave their homes often in distressing circumstances. They undertake difficult journeys, experience long periods of uncertainty in temporary accommodation sometimes in refugee camps or detention centres, before they have an opportunity to settle and be accepted in a new home. Their efforts to survive are underpinned by severe feelings of loss and loneliness for their home, family, friends, country and sense of familiarity. *Muktar and the Camels* (Graber, 2009) brings to life the plight of child refugees from Somalia and the challenges they face in adjusting to a new way of life away from home. Muktar who lives in an orphanage on the border between Kenya and Somalia, longs deeply for his parents and his former nomadic lifestyle.

Stop dreaming lazy fellow!" Mr Hassan claps his hands. "Don't cause trouble," whispers Muktar's best friend, Ismail. Muktar stirs his posho with sticky fingers. "My mother and father rest in graves beneath piles of stones." He scoops the porridge into his mouth. "I miss my parents. I miss wandering." He stares at the Acacia trees dotting the scrubby land. "And I miss camels.

The illustrations are beautiful and are slightly out of focus, capturing the dreamlike quality and personality of the young boy and the camels. At the back of the book there is a brief note about Somalian nomads and the camel caravan of the Kenya National Library Service. In a region characterised by harsh climatic conditions, bad terrain, and poor transport

infrastructure, the camels carry books to children, adults, and community health workers who would otherwise be unable to access a library.

Identity:

The journey of a refugee and the process of learning to live in a new environment poses a range of challenges to identity. Refugee children have to move between the worlds of home, unfamiliar classrooms, and a new unfamiliar culture. Kenner and Kress (2003) describe how children live in ‘simultaneous worlds’. Throughout this process children reinvent themselves and re-establish their identities. Shaun Tan author of *Lost Thing* (2000), *Red Tree* (2010) and *The Arrival* (2007), talks about the notion of belonging and ‘the problem of belonging’ which he considers to be an existential question, which everyone deals with from time to time. It comes to the surface when we are in new situations such as, a new job or relationship, facing a crisis or settling into a new country.

My name is Sangoel (2009) is told through the perspective of a young Sudanese Dinka boy who with his family leaves a refugee camp to be resettled in the United States. Sangoel is sad because people cannot pronounce his name properly. This can be seen as a metaphor for the need for identity and heritage to be respected and the difficulty all refugees face when settling into a new country. Sangoel finally asserts his identity and teaches his classmates and teacher to pronounce his name correctly.

As refugees settle into new homes, their children develop new identities which encompass the values and cultures of their parents along with the ideals and aspirations of their friends, schools and society. Sociological literature refers to the idea of a ‘third culture’ perspective. When third-culture individuals from different cultures (individuals who have integrated aspects of the other culture into their own personal psychology) begin working together with each other, they may evolve entirely new ways of doing things (Evanoff, 2001).

Sometimes people who move from one culture to another, experience a sense of displacement. Even though they are happy in their new culture, they miss aspects of their former culture. *Grandfather’s Journey* (Say, 2008) is inspired by the journey from Japan to United States taken by the author’s grandfather. This story beautifully describes through text and illustrations the love that he and his grandson feel for both countries. The internal struggle of his grandfather also continues within Say, who writes that he, too, misses the

places of his childhood and periodically returns to them. This is eloquently conveyed by the last line *'The funny thing is, the moment I am in one country, I am homesick for the other'*

Resilience of refugees:

All children are resilient but the refugee experience often pushes this resilience to the limit. Many of the picturebooks in this chapter illustrate the hardships and resilience of refugees as they await acceptance in a new country. Some of the stories show how children find strength and support in the most unusual ways. John Heffernan's *My Dog* (2001) is a picturebook about the plight of a young boy from the former Yugoslavia. Alija's village is torn apart by fighting and tensions between neighbours of different ethnic backgrounds. Seen through the eyes of a young boy, it describes terrible suffering as a consequence of ethnic cleansing in the former Yugoslavia. Alija loses his mother, father, sister, aunt and grandmother but is comforted by the companionship of a dog who is also a refugee.

Thousands of orphaned boys fled Sudan's civil war and forced military service by walking over 3,000 kilometres to Camp Kakuma in Kenya. The boys' strength and persistence through adversity is the overwhelming message of the book *Brothers in Hope: the story of the Lost Boys of Sudan* (2005). Based on true events, this moving picturebook tells the story of Garang, an eight year old Sudanese boy, whose family and village are overtaken by war, whilst he is away tending cattle. Garang is forced to embark on an epic journey across deserts and mountains, to Ethiopia and eventually to Kenya. He joins a band of over 1,000 boys, some as young as five, who share his predicament. Despite the hardships of a perilous journey and years spent in refugee camps, Garang occupies himself with the welfare of younger boys, seizes any educational opportunity, and never loses hope of a new life in a permanent place of safety. In *Four Feet Two Sandals* (Williams, 2007) two girls living in a refugee camp in Kenya with calloused and worn feet, each find one sandal of a pair. The girls resolve to take turns wearing the sandals. Friendship emerges as an important strategy for survival.

The journey:

Many picturebooks feature the story of the journey itself. *Ziba came on a boat* (Lofthouse, 2007) is a story of a young girl and her mother escaping by boat to Australia. The author Liz Lofthouse was inspired by stories told to her by people from the Hazara community in Australia who are refugees from Afghanistan. *When I left my village* (Schur, 1996) follows a family of Ethiopian Jews in their escape from drought and persecution. Traveling through

plains, mountains and deserts, 12-year-old Menelik along with his parents, and younger brother, head for a Sudanese refugee camp. From there, the people are airlifted to Israel, given homes, clothing, and food; and assimilated into a culture that offers them freedom, safety, and equality. The boy tells the story of the perilous journey of days filled with hunger, fear of discovery, and death; of a furtive border crossing, of weeks of unsanitary living in the crowded camp; and, finally, of resettlement in a small white hut in the hills near Jerusalem. A map of the Middle East shows the family's escape route, and an author's note adds historical information.

Upheaval and chaos during departure:

It is difficult for children to imagine what it would be like if they had to pack suddenly and leave their family, home, friends and country. We may have to worry about finance, access to jobs and rising petrol prices, but being displaced, our lives threatened and our dreams shattered, is not something any of us consider could happen. John Marsden and Matt Ottley have produced a powerful picturebook *Home and Away* (2008) about the disintegration of one happy, loving family due to war.

The following is written on the dust jacket:

Everyone wants a place of safety, a place to share with the people they love. A place to relax. A home. Right now, more than a billion people don't have a home, that's one in seven of the world's population. There are only two places you can be in life: home or away.

In this picturebook for older readers (9-15 years), the authors challenge us to imagine that we are refugees, sailing the world in search of refuge. An ordinary family living in the suburbs of Sydney has to flee because of a sudden disastrous war. They have a harrowing journey and the children are finally taken to a detention camp. The front cover depicts a small boy trapped behind a tall wire fence topped with barbed wire.

The word *Home* in the title is crossed with barbed wire. This picturebook is bleak but well worth discussing in the light of the plight of refugees throughout the world.

Settling into a new country:

The process of settling into a new country varies from person to person. Some picturebooks feature the difficulties refugees face adjusting to a new environment. In *The Colour of Home*

(2003), Hassan's family flee Somalia. He feels out of place in a new, cold, grey country. At school, Hassan paints a picture showing his Somalian home, with the harsh colours of war from which his family has fled. He tells his teacher about their voyage from Mogadishu to Mombasa, then to the refugee camp and on to England. But gradually things change. When Hassan's parents put up his next picture on the wall, Hassan notices the maroon prayer mat, a bright green cushion and his sister Naima's pink dress, the new colours of home

Shaun Tan's *The Arrival* (2007) features the story of a young husband and father who emigrate to a new land in order to build a better life for his family. Told through a series of wordless images, the book explores many aspects of arriving in a new country from the perspective of the immigrant, the almost never ending possibilities for linguistic and cultural confusion, the need to relearn even simple things such as preparing the native fruit and vegetables, buying a bus ticket or posting a letter. With a suitcase and some money, the immigrant must find a place to live, food to eat and some kind of gainful employment. He is helped along the way by sympathetic strangers, each carrying their own unspoken history, stories of struggle and survival in a world of incomprehensible violence, upheaval and hope. Helped by the kindness of others the immigrant gradually settles in, finds a job and is able to save enough to pay for his wife and daughter to join him.

One day his daughter goes shopping and she helps another new arrival and thus one immigrant's journey comes full circle as a new one is just beginning. Whilst *The Arrival* does not shy away from darker sides of humanity, it is ultimately a wonderful exposition of human kindness, warmth and generosity. It demonstrates how braveness of spirit can conquer fear, terror and sorrow. The book features 800 stunning drawings with no text. Designed as old photographs, worn around the edges, gently creased through years of handling, Tan brilliantly captures the strangeness of everything. On closer examination, objects which appear familiar such as a car are actually quite strange. Just as the book is wordless, so is the immigrant. The whole essence of the book is captured in the presentation of the book itself, a hard back publication which has the look and feel of an old but much loved leather notebook.

Challenging experiences in new country:

Having successfully escaped from conflict and after an arduous journey, an asylum seeker may think his\her troubles are over once they arrive in a new country. However, one of the most challenging and confusing stages of the asylum seeking process, is yet to be endured. Simply told from the perspective of a young girl, *A True Person* (Gabiann, 2008) illustrates

some of the challenges faced by asylum seekers on arrival in a new country. Zallah and her mother who have escaped from a war torn country, find themselves in a refugee detention centre in Australia, while their application for admission to the country is being processed. The illustrations are powerful including one picture of her mother talking to two officials. Here, the reader shares Zallah's perspective on looking up at towering adults. By the end of the story, Zallah and her mother are moving on to a less restrictive environment, closer to a 'new life'. Zallah's mother has promised her and where she will be able to go to school. Meanwhile, Zallah has made some friends at the detention centre. One, an African called Mwalo, has already been waiting for two years but is steadily confident of the outcome of his application. He is a 'true person' because his papers are in order. This logic causes Zallah to worry about her own situation, but her mother reassures her that being a true person comes from having 'eyes that see you and hearts that love you'. The story calls for tolerance and understanding.

A gifted young writer, Czenya Cavouras created *Rainbow Bird* (2007) between the ages of twelve and fourteen. Her inspiration came from talking to her grandfather about his visits to an immigration detention centre and then imagining what it must be like to be a refugee. *Rainbow Bird* is a striking picturebook of few words that conveys a strong message. Readers are invited to explore the emotions that might be experienced by a young refugee, forced to flee the home they love and to endure the uncertainty and indignity of a detention centre in a new country (in this case, Australia), awaiting a decision that will affect the rest of their lives. *Rainbow Bird* ends on a note of hope, embodied in the Rainbow Bird itself, flying past the window.

Artefacts:

For some migrants, memories of home are closely associated with a treasured artefact which they have brought with them. For centuries, needlework has been part of the Hmong culture. Since the war in Vietnam and Laos, a new narrative form of 'story cloths' has emerged. As a bridge between past and present, two picturebooks tell stories of the Hmong people and their displacement.

The story cloth features in *Dia's Story Cloth* (2009): *The Hmong People's Journey of Freedom* (1996) and *The Whispering cloth: a refugee story* (1995). The first book which is suitable for older children is autobiographical, whereas the second fictional book is suitable for younger children. Both books include detailed contextual information to inform the reader about the historical and geographical background.

The Lotus Seed (1993) was a response to the large community of Vietnamese people who fled as refugees and settled in America, after an extensive period of war. The story features a graphical account of the family's flight from war to settle in America. The narrator's grandmother keeps a lotus seed from the emperor's palace garden as the old regime falls. Once the lotus seed is planted, it flowers and represents a metaphor for the adaptation and hope for the future, embodied in the younger generation of the family. Artefacts such as sweet grass baskets in *Circle Unbroken* (Raven, 2007) and quilts in *Under the Quilt of Night* (Hopkinson, 2005) feature in picturebooks about the slave trade from Africa to America. Other books which feature important artefacts for different reasons include, *The Matchbox Diary* (Fleischman, 2013), *Grandma's Humongous Suitcase: A tale of Ethiopian history and culture in a child's voice* (Abebe, 2011), *The Harmonica* (Johnston, 2008) and *The Memory Coat* (Woodruff, 1999).

Eve Bunting's book *Gleam and Glow* (2005) is based on the true story of the Malkoc family, who fled the Jezero village during the Bosnian war. Two goldfish, Gleam and Glow are placed in the care of two little girls, by a refugee who has left the village days before them. As they leave to seek safety, the oldest girl places the fish in the pond. After many months of war, the family returns to their village. Everything has been destroyed by the bombs, everything except the pond thriving with goldfish.

In *Azzi in Between*, Azzi's father an avid gardener manages to bring a bag of beans with him from his former home. A school gardening project reminds Azzi of the precious beans, her parents have managed to bring safely all the way with them. Determined to plant them, she rushes home that afternoon only to discover that her mother has cooked them as a special treat for Azzi's supper. Nevertheless she manages to locate some beans. They are planted in the school garden and represent a powerful, metaphorical image of growth and transformation including the establishment of new roots and the process of bearing fruit.

CONCLUSION

Multicultural literature can provide a mirror and a window for children as they view the world through different lens and reflect back upon themselves in a new light.

This paper takes the theme of migration with a specific focus on refugees to illustrate the potential of picture story books as a means of teaching critical literacy in a way which recognises power, the unequal distribution of resources in our society, and the perspective of the story teller. However, simply increasing children's access to multicultural literature is not sufficient in itself as a strategy for engaging children with global perspectives. Several early

childhood educators struggle with development concepts and do not move beyond superficial descriptions of lifestyles in exotic places. In some cases reading more about the world can actually negatively influence development or intercultural understanding as negative stereotypes are reinforced. Hence, it is important for early childhood educators to choose books with maximum potential for exploring global and justice perspectives. Educators need to be well versed themselves in the complexities of these perspectives and the political frameworks underpinning these concepts. Children need to be assisted, encouraged and challenged to engage with the issues raised by picturebooks in an affirmative, effective and age appropriate manner. Appropriate pedagogical choices need to be made. Issues such as perspective, power and voice need to be addressed through questions such as whose story is being told and whose story is missing?

Hope (2008) makes the argument that children's literature about the refugee experience provides an ideal context for sharing the stories, feelings and fears undergone by such children, but literature remains marginal in school libraries and classroom reading lists. This paper discusses picturebooks which embrace the refugee experience, serving the education of all children about experiences of persecution, flight and resettlement, while also reassuring refugee readers that there is new life and hope for the future in an adopted country. Books on this sensitive topic must be well written, properly researched and realistically illustrated. They must depict refugees in a positive, realistic manner. Books based on real life events must be accurate in geographical and political details. Factual accuracy and realistic characterisation are essential, if the books are to broaden the understanding of non-refugee or indigenous readers and affirm the experiences of refugee children.

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