CREATIVE LITTLE SCIENTISTS: Enabling Creativity through Science and Mathematics in Preschool and First Years of Primary Education

D3.2 Report on Mapping and Comparing Recorded Practices

ADDENDUM 11 of 13:

National Report on Approaches in Northern Ireland Policy

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Executive Summary

This report discusses the ways in which teaching and learning and assessment in early years science and mathematics education are conceptualised in Northern Ireland policy. It accompanies reports from each of the partner countries in the *Creative Little Scientists* consortium as part of the *D3.2 Report on Mapping and Comparing Recorded Practices* publication that analyses and compares policy across Europe.

In order to identify the key issues within Northern Ireland policy, as well as allowing comparisons to be made with other nations in the project, this report draws upon a survey instrument used to rate the extent to which certain approaches and the role of creativity are emphasised across a number of policy documents central to Northern Ireland early years education. The survey tool was designed drawing on two key sources. Firstly, approaches were distinguished according to nine curriculum themes: Rationale, Aims, Content, Learning Activities, Teacher Role / Location, Materials and Resources, Groupings, Time, and Assessment. Secondly, specific approaches within these dimensions were identified from prior work in *Creative Little Scientists* project (the D2.2 *Conceptual Framework* and D3.1 *List of Mapping and Comparison Factors*). The ratings from this survey provided further illumination on the nine curriculum sections within this report and ensuring that the review was as comprehensive as possible within the timeframe.

Education policy in Northern Ireland has been independent of England since devolution in 1998. The Department of Education (DENI) controls education policy across all state-funded preschools, nurseries and primary schools, publishing statutory guidelines for each age group, with the *Revised National Curriculum: Primary* published in 2007, covering foundation stage and primary education and outlining the Areas of Learning at each . At the time of publication of this report (September 2012), DENI were currently reviewing the responses to a consultation document on early years provision, with potential reforms to be published in November 2012.

While creativity is not discussed in great detail in the main curriculum, it features prominently in the accompanying *Thinking Skills and Personal Capabilities* document. Here, it is described as a skill that children should develop and learn throughout each of the Areas of Learning in the curriculum. It is intended then that creativity should permeate throughout education.

This report discusses in greater detail the findings from this national policy, and importantly the implications, not only for the fieldwork planned in the next project phases, but also for the development of policy recommendations.

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1. Introduction

1.1 Aims of national report

In order to analyse Northern Ireland policy documents, this report draws upon previous reports delivered in the *Creative Little Scientists* project, the D2.2 *Conceptual Framework* and D3.1 *List of Mapping and Comparison Factors*, which identified key dimensions pertinent to the role of creativity in early science and mathematics. As well as providing a structure for this report and facilitating comparison with other European policies, these frameworks help identify inconsistencies and tensions in the key policy messages within Northern Ireland policy.

1.2 Defining terms

Three terms often used in this report that would benefit from defining are: 'policy', 'curriculum', and 'creativity'.

1.2.1 Policy

The term 'policy' is used in this report to refer to policy texts, which Ozga (2000, p.33) defines as any *"vehicle or medium for carrying and transmitting a policy message".* However, in accordance with the aims of this report, policy will be examined in relation to messages in formal written documentation. These may include either statutory requirements or guidance.

1.2.2 Curriculum

The term 'curriculum' is often used to refer to different aspects of educational policy. In a narrower sense it refers to the content and activities prescribed. In contrast, the term can be used to capture the wider aspects of educational policy. For example, Alexander (2010, p.250) refers to the curriculum as 'what is intended to be taught and learned overall (the planned curriculum); what is taught (the curriculum as enacted); what is learned (the curriculum as experienced)'. In a similar way, Van den Akker (2007) describes three levels of curriculum policy: what is intended (the ideal and formally written), what is implemented (perceived and enacted by practitioners) and what is attained (experiences and outcomes of learners). In this light, policy texts are an element of the intended or planned curriculum: what is formally written.

1.2.3 Creativity

As reported in the *Conceptual Framework* (D2.2), the *Creative Little Scientists* project indicates a focus on little c, or personal, or everyday, creativity, i.e. 'purposive imaginative activity generating outcomes that are original and valuable in relation to the learner'. In the *Literature Review of Science and Mathematics Education* (Addendum 1 of 4 of D2.2 *Conceptual Framework*) in pre-school and early years of primary school, the following definition is used in relation to being creative in science and mathematics: 'to generate alternative ideas and strategies as an individual or community, and reason critically between these'.

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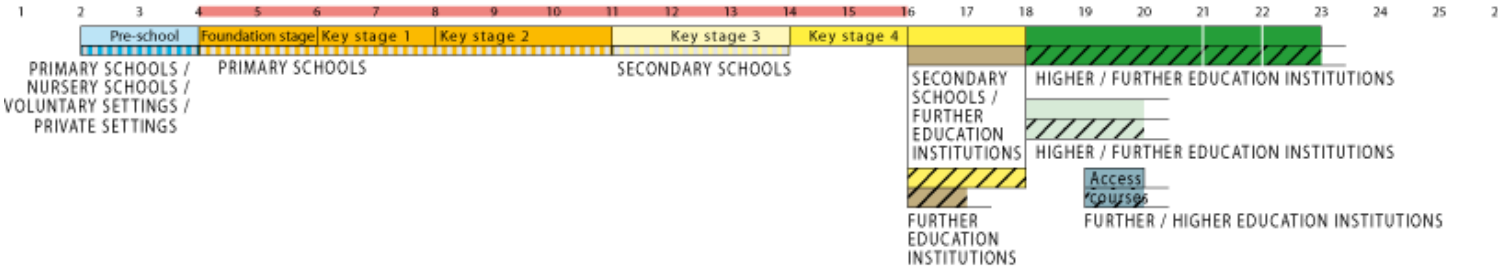
2. Overview of National Early Years Education Provision and Policy

Structure of the Northern Ireland Education System (as of 2011/12)



From Eurydice website

As the figure above shows, full-time education in Northern Ireland is compulsory from age four while there is part time, non-compulsory education provision from age two. From the documentation found, formal guidance for education from the Department of Education (DENI) starts at age four in the Foundation Stage. This is in the form of the compulsory ***Northern Ireland Curriculum: Primary*** **(DENI 2007a)**, published by the government, which applies to Foundation Stage, Key Stage 1 and Key Stage 2. This document will be discussed in more detail later in the document. For younger children, there is also the ***Curricular Guidance for Pre-School Education*** **(DENI, 2006a)**. This is the statutory document which is used in all state-funded nursery and playgroups. This applies to children aged two to four. Again, this is discussed in more detail later in the report.

It is important to note, that by empirical phase of the *Creative Little Scientists* project, policy in the Foundation Stage may have changed. In June 2010, the government published a consultation document, ***Early Years (0-6) strategy*** **(DENI, 2010a)** which proposed eight main changes to education for young children. In July of this year (2012), the Department of Education published a summary of responses to this consultation document. The responses to the document (discussed in more detail below) were largely negative, and thus a revised document that will outline more specific guidelines is to be published by DENI in November 2012.

The ***Effective Pre-school Provision in Northern Ireland (EPPNI) Summary Report*** notes that;

> "Within nursery schools/classes and reception groups/classes the legal minimum requirement is one adult to thirteen children, whilst a ratio of one adult to eight children is required for playgroups and private day nurseries", **(Melhuish et al., 2006, p. 16**)

This requirement is noted again in the ***Review of Pre-school Education*** **(DENI, 2006b)** however they acknowledge that "in practice, it is often higher" **(p. 20)**.

Additionally, an ETI report ***The Quality of Educational Provision for Reception Children in Primary Schools (ETI, 2004)*** notes that government directives state that no class should be

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more than 25 children, their study found that 15% of schools surveyed had 26 or more, while 3% had more than 30 children in their class.

In both the Foundation Stage and in Key Stages 1 and 2 of primary school, mathematics (in the form of mathematics and numeracy) and science (in the form of 'science and technology' within the overall subject area of 'The World Around Us') is taught by the practitioner. Teachers are encouraged to "use a range of organisational approaches, such as setting grouping or individual work" **(DENI, 2007a, p.3)** across the curriculum in order to "meet the needs of all pupils". This, it would seem, is usually done in whole class or large groups.

The *National Curriculum* was introduced in 1989 following the 1988 Education Act. From 1990 until devolution in 1998, education in Northern Ireland largely followed education in England and Wales, with minor amendments to the *National Curriculum* published in 1988. Since Northern Ireland devolution, education has been the responsibility of the Minister for Education, now Department for Education in Northern Ireland (DENI).

Currently, the main document in place is ***'Northern Ireland Curriculum: Primary'***, published in 2007 by DENI, which details the educational aims from Foundation Stage to the end of Key Stage 2. This is a compulsory document. This document contains both the curriculum content that children should learn but also the 'thinking skills and personal capabilities' that they should develop throughout their school life.

In support of this then, DENI has published ***'Thinking Skills and Personal Capabilities'*** [TSPC] **(DENI, 2007b)** which provides more details about the skills which children should develop throughout their education. While the skills are compulsory, this document is not per se, rather a guidance document as to how the TSPC may be put into practice. It is in the TSPC document that many of the skills that may traditionally be associated with both science and creativity can be found (discussed in further detail below). This appears to suggest that there is a strong skills-emphasis in Northern Irish education in addition to the emphasis on knowledge or facts. Indeed, section 1.6 of the curriculum **(DENI, 2007a, p. 5)** suggests that, "At the heart of the curriculum lies an explicit emphasis on the development of skills and capabilities for lifelong learning". These skills include the TSPC, as well as 'communication', 'using mathematics' and 'using ICT'.

For children aged two to four attending state-funded nursery or pre-schools, there is the ***Curricular Guidance for Pre-School Education*** **(DENI, 2006a)** document. This provides the statutory requirements for provision for children in these establishments. This provides information on guidance on best practice and the seven strands of the curriculum.

In addition to this, there are accompanying documents that can be found on the DENI website that provide information on all stages of compulsory education (e.g. *http://www.nicurriculum.org.uk/foundation_stage/* for Foundation Stage and *http://www.nicurriculum.org.uk/key_stages_1_and_2/*). These pages include a number of documents on assessment (discussed in more detail below)_ and documents on the interpretations of curricula, such as ***Understanding the Foundation Stage*** **(DENI, 2006c)**, a

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policy advice document. Further web-based resources highlight the emphasis on learning through play and learning outdoors in the Foundation stage. While these are web-based, many do appear to be available in hard-copy.

An additional document that appears central to teaching in Northern Ireland is the ***Assessment for Learning*** **(CCEA, 2009)**: a guidance document for teachers on assessment in the classroom. Indeed, the documentation appears to suggest that the majority of assessment in the first years of education is classroom-based, with less emphasis on externally-driven, accountability-motivated assessment in schools.

There does not seem to be any provision for modern languages in the Northern Ireland Curriculum, however this may be due to learning English in Irish language schools. While there is curricular provision and teacher-resources for French, German and Spanish teaching and learning in the primary school (e.g. *http://www.nicurriculum.org.uk/microsite/pl/docs/Guidancev2.pdf*), this is not compulsory.

The Department for Education (DENI) published a consultation document in 2010 on Early Years education (***Early Years (0-6) Strategy***). A questionnaire on the document was sent to a wide variety of participants, including parents, teachers, NGOs and education authorities. Media reports on this suggested that the document was poorly received, and up until very recently the Department of Education had not responded to these. However, a summary of the responses to the consultation was published at the start of July 2012 (***Summary report of responses to the consultation on the Early Years (0-6) Strategy*** **(DENI, 2012)**, available at *http://www.deni.gov.uk/response_to_early_years_consultation.pdf*). There were eight key objectives highlighted in the consultation and on average, 93% of participants disagreed with each proposal. Among the issues raised were a lack of evidence backing the objectives, how the proposed changes would be funded and who would manage their implementation.

The final summary of the document suggested that,

> "Overall, the additional comments across all groups were primarily negative; respondents were concerned that the strategy was poorly drafted, unrealistic and lacking detail, and requiring more work by the DE." (**DENI, 2012, p. 48**)

A press release from the Minister for Education accompanying the publication of the summary suggests that a revised strategy is pending, and is aimed to be published in November 2012. Where this leaves early years education currently in Northern Ireland then is slightly in limbo,

There are a number of documents which provide information of social issues in Northern Ireland education, with varying degrees of detail. ***Every School a Good School*** **(DENI, 2009)** acknowledges that factors such as social deprivation have adverse effects on attainment and details what the government perceives as the cause of low attainment, whilst providing a wide range of strategies in order to ensure that all schools provide the best possible opportunities for their children. There are six main approaches to the "school improvement policy" proposed by DENI. These are

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- "effective leadership and an ethos of aspiration and high achievement;
- high quality teaching and learning;
- tackling the barriers to learning that many young people face;
- embedding a culture of self-evaluation and self-assessment and of using performance and other information to effect improvement;
- focusing clearly on support to help schools improve – with clarity too about the place of more formal interventions where there is a risk that the quality of education offered in a school is not as high as it should be;
- and increasing engagement between schools, parents and families, recognising the powerful influence they and local communities exercise on educational outcomes."

(DENI, 2009, p. 17).

The document continues to describe further how each of these may be addressed in order to raise attainment in what they term as under-performing schools.

A report entitled, **Educational Disadvantage: the Protestant Working Class (Purvis et al. 2011)** also looked specifically at one social group and the challenges they face. This research took a more holistic approach at looking at underachievement and found that there were many external contributing factors to school performance. This report provided a number of recommendations for addressing these. How much impact these are likely to have is perhaps summed up by Sir Iain Hall in the foreword, who when discussing his similar research many years previously states, "At that time I highlighted to both the Education and Library Board and to head-teachers that, in my opinion, underachievement would continue to grow… Some twenty years later, I find it personally sad that your report seems to confirm my earlier observations." **(p. 3)**.

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3. Research Questions and Methodology

3.1 Research Question

The main research question for this Work Package, adapted for this National Report is:

How is teaching, learning and assessment of science and mathematics in the early years conceptualised in policy in Northern Ireland?

The sub questions identified within this overarching research question were:

- *What is the role of creativity in the way teaching, learning and assessment of science and mathematics in the early years are conceptualised in policy in Greece?*
- *What are the main similarities and differences between mathematics and science in the way teaching, learning and assessment of these areas in the early years are conceptualised in policy in Northern Ireland?*
- *What are the main similarities and differences between pre-school and school phases in the way teaching, learning and assessment of science and mathematics in the early years are conceptualised in policy in Northern Ireland?*

In order to examine how teaching, learning and assessment are conceptualised across Northern Irish policy, this report drew upon the framework of curriculum components *'the vulnerable spider web'* (see van den Akker, 2007) that identifies the following key questions related to student learning:

- Rationale or vision: Why are children learning?
- Aims and objectives: Toward which goals are children learning?
- Content: What are children learning?
- Location: Where are children learning?
- Learning activities: How are children learning?
- Teacher role: How is the teacher facilitating learning?
- Materials and resources: With what are children learning?
- Grouping: With whom are children learning?
- Time: When are children learning?
- Assessment: How to measure how far children's learning has progressed?

As well as factors relating to the curriculum, the *Conceptual framework* (D2.2) identified Teacher factors as a significant in teaching, learning and assessment approaches in the classroom. This is further indicated in the D3.1 *List of Mapping and Comparison factors* derived from the *Conceptual Framework*. Consequently, this project set out to examine Teacher factors addressed in policy, in particular the approaches documented in relation to both:

- Initial Teacher Education: What are the requirements for initial teacher education?
- Continuing Professional Development: What are the opportunities for Continuing Professional Development?

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3.2 Method

3.2.1 Data selection

Policy documents were chosen that captured the different aspects of curriculum according to the nine dimensions identified by Van den Akker (listed in the previous section) in relation to early science and mathematics. The documents embodying the curriculum in Greece present the rationale behind the reform effort, aims and purposes, learning outcomes and activities, topics, competences and skills promoted, role of the teacher, assessment criteria and methods, as well as suggested teaching materials.

Additional materials reviewed include Eurydice reports, policy review from an EU Comenius project and a number of research articles focusing on curriculum reform in Greece. All documents apart from those that form the National Curriculum have been reviewed to provide the necessary context to the analysis of the main curriculum documents and have not been used to complete the policy questionnaire.

3.2.2 Survey tool

A survey tool was developed in order to quantify judgments about the extent to which particular approaches were emphasised in Northern Ireland policy documents. Whilst quantifying approaches is problematic, this was considered important in order to support comparisons between European partners, as well as provide an informative representation of approaches within Northern Ireland documents.

The survey tool comprised of two main sections: one relating to Teaching, Learning, and Assessment approaches. This was subdivided according to the dimensions of curriculum described previously, namely: *Rationale; Aims; Content; Location; Learning activities; Teacher role; Materials and resources; Grouping; Time.* The other section focused on Teacher Education, subdivided into Initial Teacher Education and Continuing Professional Development.

The sections were comprised of a series of questions about approaches advocated in national policy. In each section researchers in partner countries were asked to provide background information or evaluate the extent to which particular approaches were, or were, not emphasised across policy documents, and also the extent to which the role of creativity is emphasised in these approaches. These approaches listed were carefully drawn from prior work in the Creative Little Scientists project, namely the D2.2 the *Conceptual Framework* and the D3.1 *List of Mapping and Comparison factors*, which drew attention to significant approaches characteristic of creativity in early years science and mathematics. A summary of the emphasis ratings given for Greek policy is presented in Appendix A; information on the background sections of the questionnaire are integrated into the main text of this report.

3.2.3 Completion of the Survey Tool

The author of this report, one of the *Creative Little Scientists* project team, completed the Survey tool. Inter-rater reliability was not possible due to project limitations and the importance of the local expertise of researchers completing the survey tool for their national

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documents. Therefore, it was required that each project member completing the survey provided justifications for their responses alongside specific references to the policy documents to support judgements made. These justifications were assessed and discussed with a second project team member.

3.2.4 Context of policy messages

A significant challenge of analysing and quantifying policy messages is that they need to be interpreted in relation to the particular national context: taking into account economic, political, geographic, historical factors for example. Consequently, the results of the survey analysis are interpreted within the broader background to current policy, drawing upon wider sources.

This review focuses largely on six key documents, each selected for their particular focus. The first is the compulsory ***Northern Ireland Curriculum: Primary*** **(DENI 2007a)**. This provides explicit outcomes for education for the Foundation Stage, Key Stage 1 and Key Stage 2 (ages four to 11). As the overriding compulsory document for early years and primary education in Northern Ireland it was imperative to include this. This document was especially useful as it provided information of both the Foundation stage and first years of primary school. The second document that is considered is ***Thinking Skills and Personal Capabilities*** **(DENI 2007b)**. This is a guidance document and outlines the skills that children should acquire during their education. These skills and capabilities are to be taught throughout the curriculum, rather than as discrete 'subjects'. This document, as with the primary curriculum, provides a large amount of information on the day-to-day classroom activities. The third was ***Curricular Guidance for Pre-Schools*** **(DENI, 2006a).** While this document is currently under review, it provides the statutory requirements for early years provision in state-funded nurseries. The last curriculum-based document that the report looks at is the ***Count, Read, Succeed*** **(DENI, 2011)** document. This focuses more on mathematics than science education, however it provides information and critical discussion on how mathematics and mathematics education are perceived and conceptualised within the Northern Ireland education system as a whole. There is not a large discussion of assessment in the three documents above, and therefore it was important to source Therefore, when considering the main aims of assessment in Northern Ireland, this report looks mainly the ***Assessment for Learning: A practical guide*** **(CCEA 2009)** document published by the Council for Curriculum Examinations and Assessment. This is a long document that details various approaches that teachers may take in their assessment of children's learning. The fifth main document to be considered in this national report is the ***Osler Report*** **(2005)**, a review of teacher education policy in Northern Ireland, The Osler Report draws on a number of previous studies and reports and considers a wide range of features of teacher education, including balance of Higher Education and in-school training, CPD and the impacts of curricular documents. As such, this provided a useful summary of the current state of teacher education, as well as highlighting the issues that may need addressing in the future.

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These five documents were selected on the basis that they provided information on a wide range of factors and answer many of the queries raised in the report. Nevertheless, in addition to these documents, a number of additional resources were also used to provide further, more detailed information about particular areas. These included ***'State of the nation: Report on 5–14 science and mathematics education'*** **(Royal Society, 2010)**, a report by the Royal Society on the trends of mathematics and science education in England, Northern Ireland, Scotland and Wales; the DENI website, (www.deni.gov.uk) which provided up-to-date information on teacher training, a number of documents specific to 'The World Around Us' Area of Learning, including '*Implementation of The World Around Us*', a resource for teachers on how this area of learning may be taught, '*The World Around Us: FAQ*', a web-based resource from the DENI website for teachers. There were less web-based resources for mathematics and numeracy in the Foundation Stage, only providing information on the statutory requirements. Similarly at Key Stage 1, there was further information on the exact processes of mathematics that children were required to learn. When considering TSPC, '*Thinking Skills in the Early Years: A guide for practitioners*' **(Walsh et al., 2008)**, a research report on how thinking skills may be taught in the early years was also consulted.

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4. Approaches to Teaching, Learning and Assessment

This section summarises and reflects upon the findings from the policy questionnaire. The overarching aim is to draw out key messages and highlight any issue, tensions or criticisms that may exist for different aspects. Reflecting the questionnaire, the findings are reported under headings taken from van den Akker's framework of components (van den Akker, 2007) as follows:

- Rationale or Vision
- Aims and Objectives
- Content
- Learning Activities
- Teacher Role / Location
- Materials and Resources
- Groupings
- Time
- Assessment

4.1 Rationale or Vision

What are the key summary points?

The stated rationale behind the curriculum appears to reflect a marketised view of education – that the aim of education is to produce economically successful individuals. The recently published document ***Count, read, succeed*** **(DENI 2011)** discusses Northern Ireland's performance in international tests (PISA) and uses this as a justification for recommending 'improvements' or changes to the current curriculum. Using the justification of global competition as a motivation for educational approaches

However, looking at the curriculum itself, of the three objectives described in the curriculum, and illustrated in the table below, only one can really be described as focused towards the market forces. Since this is only one of three, whether the curriculum reflects this view may be up for debate. Indeed, that the *Count, read, succeed* document has been released five years after the publication of the curriculum may suggest a change in focus in the curriculum. Indeed, the government has suggested that there is to be a new early years strategy to be published in November 2012 (discussed below), and since the draft was so poorly received, the exact content and direction of the new strategy is unknown. Given the emphasis of *Count, read, succeed* it may be that there is an increased emphasis on a marketised approach to education, and indeed this appears to be supported with the increased emphasis on summative testing (discussed below). This can however only be speculation at the current time.

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In what ways is the role of creativity emphasised?

When looking at creativity in the curriculum, there seem to be some contradictions between the original rationale and the rationale behind creativity being included. While the literature can position creativity from a marketised perspective (for example, creativity as a means to producing economically useful or beneficial outcomes) when looking at the '*Thinking Skills and Personal Capabilities*' (**DENI, 2007b**) document, creativity appears to be framed much more from a child-centred approach. The TSPC discusses the importance of "self-expression and value[ing] individuality" as a means "helping [children] become more resilient in their outlook" (**DENI, 2007b, p.5**). Creativity is positioned therefore much more from the perspective of social- or personal-good rather than necessarily economic good.

What are the differences, if any, between science and mathematics?

Looking towards the ***Count, Read, Succeed*** **(DENI 2011)** document, it refers largely to changes in mathematics and literacy and their *impact* on science and technology in *industry*, rather than in educational terms. It could be argued then that it is only really mathematics education and not necessarily science education that is driven by a market-forces view of education. Indeed, looking at the 'World Around Us' Area of Learning (in which science education is framed, discussed below) much of the discussion is around 'enabling exploration' and looking to explore questions about the world and themselves, rather than any emphasis on specific facts or knowledge per se.

4.2 Aims and Objectives

The *'Northern Ireland Curriculum: Primary'* states that the aim of education in Northern Ireland is "to empower young people to develop their potential and to make informed and responsible choices and decisions throughout their lives"

The objectives of the curriculum are split into three areas. The curriculum aims to "help young people develop as individuals; contributors to society and; contributors to the economy and environment." Each of these three areas has a number of sub-areas – shown in the table below (taken from the Curriculum document, **DENI, 2007a**)

Individuals	***Contributors to Society***	***Contributors to the Economy and Environment***
Throughout the primary stages teachers should help children to: • develop self-confidence, self-esteem and self-discipline; • understand their own and others' feelings and emotions; • develop the ability to talk about how they feel; • develop their motivation to learn and their individual creative potential; • listen to and interact positively with others;	Throughout the primary stages teachers should help children to: • become aware of some of their rights and responsibilities; • become aware of some of the issues and problems in society; • contribute to creating a better world for those around them; **(Citizenship)** • develop an awareness and respect for:	Throughout the primary stages teachers should help children to: • develop literacy, numeracy and ICT skills; • develop their aptitudes, abilities and creativity; • be willing to expand their learning and performance throughout their lives; • work independently and as a member of a team; • develop perseverance, initiative and

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• explore and understand how others live; **(Personal and Mutual Understanding)** • have an understanding of healthy eating and the importance of exercise; • develop positive attitudes towards an active and healthy lifestyle, relationships, personal growth and change; • become aware of key issues which affect their physical, social and mental well-being and that of others; • develop an awareness of their own personal safety; **(Personal Health)** • develop an awareness of right and wrong; • develop an awareness of how their actions can affect others; • understand that values, choices and decisions should be informed by a sense of fairness; • take responsibility for their actions; • develop tolerance and mutual respect for others; **(Moral Character)** • develop a sense of awe and wonder about world around them. **(Spiritual Understanding)**	- the different lifestyles of others; - similarities and differences in families and people in the wider community; • understand some of their own and others' cultural traditions; • be aware of how we rely on each other; (**Cultural Understanding)** • be aware of, and use, information available to us through all sorts of media; • become aware of the potential impact of media in influencing our personal views, choices and decisions; **(Media Awareness)** • become aware of the imbalances in the world around us, at both a local and a global level; • become aware of the potential impact of developments upon the lives of others. **(Ethical Awareness**)	flexibility; • be willing to take calculated risks when appropriate; • use critical and creative thinking to solve problems and make decisions; • identify the main reasons why people set up their own business. **(Employability)** • learn to manage their money and build up savings; • interpret information in order to make informed choices as consumers; • develop an understanding of the importance of using resources carefully in the classroom; • develop an awareness of some environmental issues; **(Economic Awareness)** • appreciate the environment and their role in maintaining and improving it; • understand how actions can affect the environment. **(Education for Sustainable Development**)

Additionally, the curriculum outlines the importance of 'Using mathematics' throughout the curriculum as a fundamental aim. This, it appears is slightly different from the 'Mathematics and numeracy' Area of learning, which is more content based, but rather focuses on the application of these facts within contexts.

'Using mathematics' in the *Revised Curriculum* sets out the particular skills as;

"Across the curriculum, at a level appropriate to their ability, pupils should be enabled to:

- choose the appropriate materials, equipment and mathematics to use in a particular
- situation;
- use mathematical knowledge and concepts accurately;
- work systematically and check their work;
- use mathematics to solve problems and make decisions;
- develop methods and strategies, including mental mathematics;
- explore ideas, make and test predictions and think creatively;

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- identify and collect information;
- read, interpret, organise and present information in mathematical formats;
- use mathematical understanding and language to ask and answer questions, talk about
- and discuss ideas and explain ways of working;
- develop financial capability;
- use ICT to solve problems and/or present their work."

(**DENI, 2007a, p. 6**)

Interestingly, it is here that creativity and mathematics are considered, rather than in the context of the main curricular content.

This appears to be less so in the other skill considered in the curriculum. The skills of 'Communication' and 'Using ICT', along with 'Using mathematics', are to be implemented throughout the curriculum. Communication consists of the skills 'talking and listening', 'reading' and 'writing' and is, according the primary curriculum, "central to the whole curriculum" **(DENI, 2007a, p. 5)**. It is and important part of social, physical and emotional development and therefore is an overarching skill to be fostered and enabled throughout teaching and learning. 'Using ICT', as with 'Using mathematics', is intended to be applied across the curriculum and involves a number of different skills. Again, as with 'using mathematics', there is an emphasis on enabling children and fostering the skills in the areas entitled 'explore', 'express', 'exchange', 'evaluate', and 'exhibit'. However, there is little mention of the skills often associated with creativity, such as problem solving or creative thinking, in these skills areas.

What issues / tensions / policy criticisms exist?

Interestingly, while the rationale appears to be of a curriculum driven by marketised model of education, what is seen in the aims and objectives of education does not appear to reflect this in a way that may perhaps be expected. The emphasis on 'empowerment' and personal responsibility reflects a more 'self-actualisation' driven model of education, more commonly associated with child-centred rather than marketised education. This apparent contradiction between "vision and rationale" and "aims and objectives" is an interesting one, and how it manifests in the classroom will be interesting to see in the empirical phase of the study.

The underpinning philosophy of the Revised Curriculum was to move away from a content-based and assessment driven curriculum to one that was much more child-centred and skills-based preparing children to become successful citizens in a future society, explaining the emphasis placed on the cross-curricular skills of Communication, using mathematics, using ICT and TSPC.

However the Northern Ireland education system has always been accused of being traditional in perspective and the place of literacy and numeracy in the primary curriculum has always been prioritised. This led to a degree of tension where some educators felt that the Revised Curriculum lacked substance and that knowledge was being pushed aside to

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some extent. This was particularly so in the ***Early Years Enriched Curriculum evaluation*** (the pilot of the Foundation Stage curriculum) where there appeared to be a real tension between adopting a play-based and informal approach in the early primary school years and, at the same time, using the best research evidence and the most effective methods for teaching literacy and numeracy and maintaining high standards in these Areas of Learning."

In what ways is the role of creativity emphasised?

'Creativity' permeates the curriculum in two ways. First, it is seen as a fundamental aim of the curriculum (under the 'Individuals' strand of theme of the aims and objectives). Second it is seen as one of the 'thinking skills and personal capabilities' that should be fostered throughout the curriculum as outlined in the '*Thinking Skills and Personal Capabilities*' document (**DENI, 2007b**). It is part of the framework of skills (see diagram below) that children develop.

These two approaches are slightly different in focus. The first, as an aim of the curriculum, looks at creativity from a wider perspective. For example, 'develop[ing] individual creative potential', 'develop[ing] aptitudes, abilities and creativity' and 'using critical and creative thinking' are outlined as a specific aims and objectives of the curriculum (see table above.) As an ability or potential, this implies that creativity is something innate.

The second is as a distinct 'skill' rather than potential or ability. The distinction between these two is subtle, but important for it has important impacts on teaching. As a 'skill', it implies that creativity can be 'taught' in some way, and indeed the list of skills or activities that are listed in the 'Being creative' section of the TSPC document would suggest that practitioners "should help your children discover how to

- seek out questions to explore and problems to solve;
- experiment with ideas and questions;
- make new connections between ideas/information;
- learn from and value other people's ideas;
- make ideas real by experimenting with different designs, actions, and outcomes;
- challenge the routine method;
- value the unexpected or surprising;
- see opportunities in mistakes and failures; and
- take risks for learning.

(**DENI, 2007b, p. 5**).

The implication is that these are new skills that the practitioner can help any and all children learn, or in their words 'discover how to', rather than something that is innate to the individual.

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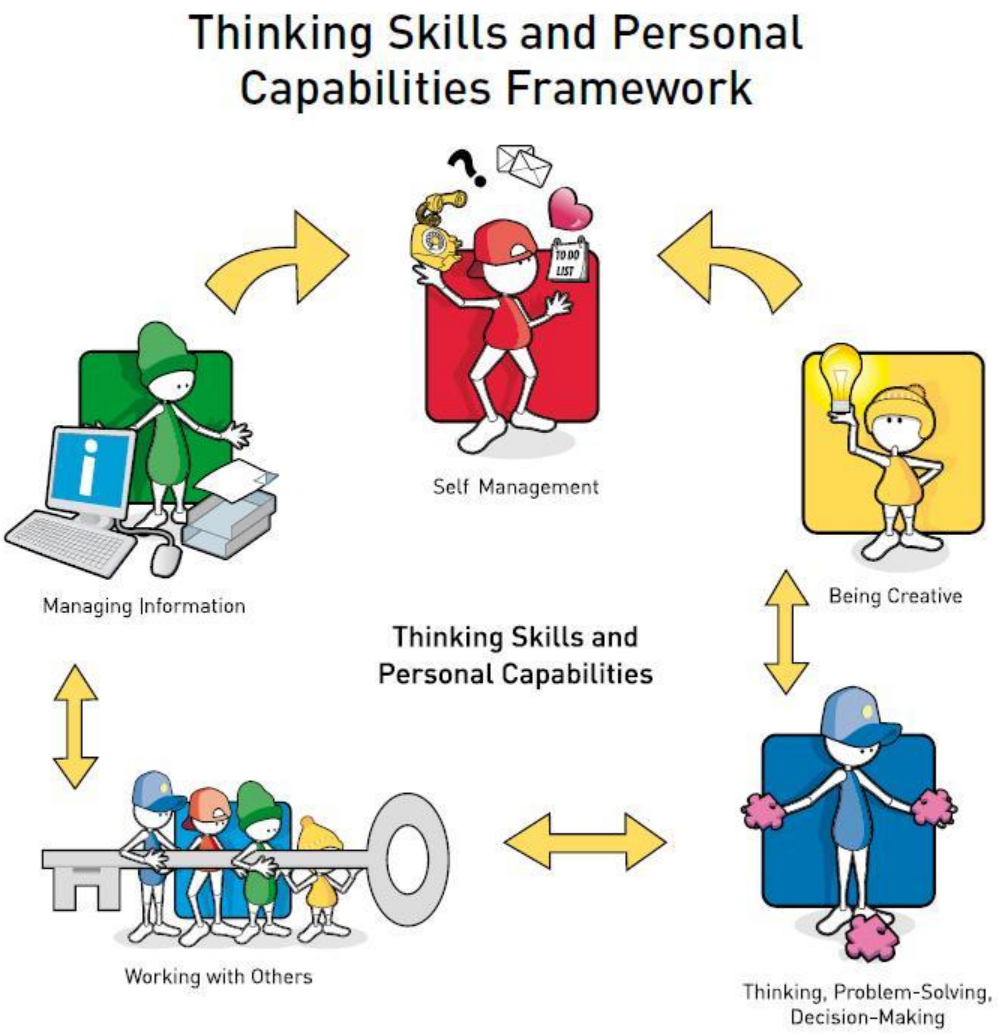

From http://www.nicurriculum.org.uk/docs/skills_and_capabilities/tspc_framework.JPG

What are the main differences between preschool and school?

While stating explicit aims for education in general at the start of the document, the Curriculum (**DENI, 2007a)**, does provide further, more explicit aims of education for the Foundation Stage. As well as repeating the initial aims set out at the start of the document, it also adds a further eight aims for the Foundation Stage, suggesting that "The Foundation Stage aims to provide a learning programme which will:

- promote children's personal development;
- promote positive attitudes and dispositions to learning;
- promote children's Thinking Skills and Personal Capabilities;
- encourage creativity and imagination;
- enable children to develop physical confidence and competence;
- develop children's curiosity and interest in the world around them;

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- enable children to communicate in a variety of ways;
- motivate children to develop literacy and numeracy skills in meaningful contexts."

(**DENI, 2007a, p. 15)**

Nevertheless, given that these are presented as almost sub-clauses to the original overall aim, it would seem that these could easily apply to the primary curriculum as well.

Again, looking to the aims of the early years education, when considering science education it is again situated in a 'World Around Us' Area of Learning, and largely reflects the aims of the Foundation Stage, and consequently Key Stages 1 and 2. The differences between the early years and primary can be found in mathematics education. In the primary school, the aim of mathematics education appears to be the development and learning of a list of statutory requirements. In the early years, the emphasis focuses more on experiencing mathematics and mathematical ideas in different contexts and familiarising themselves with the mathematical world. There is less of an emphasis in the curriculum of particular, prescribed facts that children should come to know, rather areas that they might explore, much like the 'World Around Us' Area of Learning.

What are the differences, if any, between science and mathematics?

The differences between science and mathematics education can perhaps be surmised by looking at how the aims of each are phrased at the beginning of each section in the curriculum. For science, it seems that the aim is of 'awareness', that is, children should be scientifically aware (in the form of environment etc.) whereas in mathematics, the emphasis is more on 'capability' – children should be mathematically capable or adept at the 'statutory requirements' set out in the curriculum. There do then seem to be differing aims in the curriculum. Mathematics education seems to be seen from an 'industrial trainer' perspective (**Ernest, 1991**) whereby mathematics is a set of facts to be learnt, driven by (perceived) market forces. On the other hand, there is a more child-centred approach to the 'World Around Us' segment of the curriculum. As noted above, this contrast is an interesting one and one that would be interesting to see in the classroom.

4.3 Content

What are the key summary points?

The curriculum at both Foundation Stage and Key Stage 1 and 2 is structured into 'Areas of Learning'. There are five Areas of Learning that are common to both Foundation Stage and Key Stage 1 and 2;

- Language and literacy
- Mathematics and numeracy
- The Arts
- The World Around Us
- Personal development and mutual understanding

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There is a sixth in each, termed 'Physical development and movement' in Foundation Stage and 'Physical education' in Key Stage 1 and 2.

Science education is framed as 'science and technology' within the 'World Around Us' Are of Learning. This consists of four headings, Interdependence; Place; Movement and energy; Change over time). Each of these headings has a number of sub-questions, as summarised in the tables below for the Foundation Stage and Key Stages 1 and 2.

Foundation Stage

Interdependence	Place	Movement & energy	Change over time
Pupils should be enable to explore:			
Who am I?	Where do I live?	How do things move now and in the past?	How do things change?
What am I??	How have I changed over time	Why do things move?	What kind of changes happen, have happened or might happen?
Am I the same as everyone else?	What is in my world?	How do things work?	How can we make change happen?
What else is living?	What is beyond my world?	Why do people and animals move?	
How do living things survive?	How has this place changed?	Where do things move?	
		Where do people and animals move to?	
		What sources of energy are in my world?	
		How and why are they used?	

Key stage 1 and 2

Interdependence	Place	Movement & energy	Change over time
Pupils should be enable to explore:			
'me' in the world	How place influences plant and animal life	Sources of energy in the world	Ways in which change occurs in the natural world
How plants and animals reply on each other within the natural world	Ways in which living things depend on and adapt to their environment	How and why people and animals move	How people and places have changed over time
Interdependence of people and the environment	Features of the immediate world and comparisons between places	Changes in movement and energy over time	Positive change and how we have a responsibility to make an active contribution
The effect of people on the natural environment over time	Change over time in local places		
Interdependence of people, plants, animals and place	Positive and negative effects of people on places		

(from **DENI 2006c**)

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In what ways is the role of creativity emphasised?

In terms of content in the curriculum, creativity is key to the 'Personal development and mutual understanding' strand of the Foundation Stage curriculum, while it is also discussed in the Physical education area of learning in the Key Stage 1 and 2 section of the curriculum, in terms of creative expression. Unsurprisingly, 'creativity' also appears in music and art, and features heavily in policy guidance documents such as *Learning through play* which can be found on the DENI website. In these too creativity largely focuses on the arts. In addition to this, it is also interpreted as a skill, and as discussed above, it is apparently to be fostered through the 'Thinking skills and personal capabilities' document.

In the Foundation Stage, 'encouraging creativity and imagination' is also highlighted as a specific aim of the curriculum, and the curriculum suggests that "children learn best when they have… learning experiences that encourage creativity" (**DENI, 2007a, p. 15**).

Encouragingly, it suggests in the introduction to the curriculum that when "using mathematics across the curriculum", children "should be enabled to… explore ideas, makes test predictions and think creatively" **DENI, 2007a, p. 6**). Having said this, however, when looking to the actual content of the curriculum and the academic subjects, even in the Foundation Stage creativity is largely discussed in the arts and to a lesser extent in literacy. 'Imaginative play' is discussed in drama, 'Using sound creatively' is discussed in music. 'Creativity' is not used in the actual content of the mathematics section of the curriculum.

What are the main differences between preschool and school?

The curriculum is set out in order to ensure a smooth progression from the Foundation Stage through to Key Stage 1 and 2. As such, in terms of content, there appear to be few differences between the two. The structure of the curriculum is similar, with science education still being set out as 'science and technology' within the 'The World Around Us' area of learning in Key Stage 1.

Looking to the early years, the ***Curricular Guidance for Pre-Schools*** **(DENI, 2006a)** document also outlines science and technology within what it describes as the 'World Around Us'. It is set up slightly differently, as the focus is on children observing the world through play rather than necessarily asking particular questions. Of course, observing through play may lead to exploration and the asking of questions, however this is not a stated aim in the curriculum. Mathematics too is presented differently here with less of an emphasis of particular facts and knowledge to learn, but for children to start to develop an understanding of mathematics in their everyday lives.

The aim, it appears, is to provide a smooth transition from each age phase by establishing similar Areas of Learning in each.

What are the differences, if any, between science and mathematics?

There is very little prescribed *content* in the science section of the curriculum ('science and technology' within the 'World Around Us' area of learning), rather 'statutory requirements'

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of topics which children should explore (as shown above.) Furthermore, in the Foundation Stage section of the National Curriculum document, these topics to explore amount to only one page, outlining the four headings and a number of subheadings within each of these.

In contrast, there is more description of particular skills and knowledge that children should acquire in the mathematics and numeracy Area of Learning, both in Foundation Stage and in Key Stage 1.

The differences can perhaps best be illustrated by how curriculum content is set out. In mathematics and numeracy, the learning outcomes and expectations are phrased as "children should be enabled to" (e.g. **DENI, 2007a, p. 24)**, carry out particular tasks in mathematics and numeracy, whereas in 'The World Around Us' the curriculum is less directive, stating that "children should be enabled to explore" (**DENI, 2007a p. 38)**, particular aspects of each of the sub-headings of TWAU.

What this implies then is that there is less of a focus on what might be termed 'knowledge' in 'The World Around Us' Area of Learning than in mathematics – indeed science is no longer considered a core area of learning in the revised curriculum.

4.4 Learning Activities

What are the key summary points?

At Key Stage 1, the curriculum provides a number of examples of activities or questions that children might explore as part of science and technology. Grouped under the four headings of the 'World Around Us' Area of Learning, they are presented in table form in the curriculum (adapted below).

Interdependence	Place	Movement and energy	Change over time
How we grow, move and use our senses, including similarities and differences between ourselves and other children. The variety of living things in the world and how we can take care of them. Some living things that are now extinct	The range of materials used in my area. Sounds in the local environment. How animals use colour to adapt to their natural environment. Animals that hibernate and the materials they use.	The use of electricity as an energy source and the importance of using it safely. Animals that migrate. The importance of light in our everyday lives. Different sources of light, for example, *traffic lights, candles or stars.* Devices that push, pull and make things move. Design and make simple models.	The effect of heating and cooling some everyday substances. Changes in the local natural environment, including how they can affect living things

In mathematics, a list of statutory requirements are set out which children are to learn. Rather than a list of questions or statements that children might explore, as in science, in mathematics, both in Foundation Stage and in Key Stage 1, as shown below (table for Foundation Stage)

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Understanding number	Counting and number recognition	Understanding money
• count a variety of objects, for example, *number of cups, apples, crayons;*	• count in the context of number rhymes, jingles and stories;	• use money in various contexts;
• develop an understanding of one-to-one correspondence and come to appreciate that the size of a set is given by the last number in the count;	• count forwards in ones within 5/10 from different starting points;	• talk about things that they want to spend money on;
• investigate different ways of making sets for a given number within 5/10;	• count backwards in ones within 5/10 from different starting points;	• understand the need to pay for goods;
• match numerals to sets;	• recognise numerals up to 5/10;	• become familiar with coins in everyday use;
• order numerals and sets within 5/10;	• state, without counting, quantities within 5;	• talk about different ways we can pay for goods, for example, *cash, cheque, credit/debit card;*
• develop an understanding of conservation of number within 5/10;	• make a sensible guess of quantities within 10;	• use their number skills in shopping activities.
• understand in counting activities that 'none' is represented by zero;	• explore numbers relevant to their everyday lives, for example, *the number of children allowed to play in the sand, telephone numbers, house number;*	
• explore ordinal number, for example, *first, second, third, last, between, by completing practical activities;*	• extend, when appropriate, counting in ones and recognition of numbers beyond 10;	
• explore the number that comes after, before, between a given number;	• extend activities to include counting in 2s, 5s and 10s.	
• carry out simple mental calculations, for example, *1 more than/less than within 10; 2more than/less than within 10;*		
• extend, when appropriate, understanding of number beyond 10.		

The list in Key Stage 2 is even longer, repeating many of the above and expanding on and adding others.

In what ways is the role of creativity emphasised?

As noted above, 'creativity' features in non-statutory guidance web-resources such as *Learning through play* and *Learning outdoors.* Here however the focus is largely on the arts subjects – creativity features mainly in discussions about art and music.

While children should "think creatively" in mathematics, there is little indication in the statutory requirements as to how this might be achieved in the classroom. As has already been noted, mathematics is presented as 'statutory requirements' which children must learn, which appears to limit the scope for creativity both in children and in teachers.

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In the 'World Around Us' area of learning, there is perhaps more scope for creativity, especially as the themes and topics mentioned in the 'World Around Us' are to be integrated across the curriculum.

Nevertheless, it would be disingenuous to suggest from the curriculum and the accompanying documents (such as *Learning through play'* from the DENI website) to suggest that creativity is emphasised or

What are the main differences between preschool and school?

One perhaps unsurprising difference between Foundation Stage and Key Stage 1 in both mathematics and in science and technology is the size of the curriculum – there are more statutory requirements in mathematics and more areas to explore in the World Around Us in Key Stage 1. Nevertheless, the way in which they are presented is similar – in both Foundation Stage and Key Stage 1, mathematics is presented in terms of statutory requirements, while the World Around Us consists or potential questions to explore.

In contrast, the ***Curricular Guidance for Pre-Schools*** **(DENI, 2006a)** appears to suggest that children learn across the largely through exploration and play. While this exploration may be seen in the 'World Around Us' in primary school, exploration and play appears far more in mathematics as well, where there are not statutory requirements.

What are the differences, if any, between science and mathematics?

As stated in the curriculum, the mathematical skills shown in the table above are "statutory requirements". Teachers "should enable children to develop knowledge, understanding and skills" **(DENI, 2007a, p.24)** in these statutory requirements. This is an important point to note – while in science and technology children may have questions/statements that they might explore, in mathematics they have "statutory requirements" that they must learn.;

4.5 Teacher Role / Location

What are the key summary points?

When looking at the curriculum, the phrase 'children should be enabled to' is repeated in all of the Areas of Learning and in all Key Stages. The implication appears to be that the role of the teacher is to assist children in their explorations rather than as a direct instructor.

This enabling approach appears to be supported by in the Foundation Stage, such as the *Understanding the Foundation Stage* (**DENI, 2006c**) document which suggests that some of the key features of adults working with children are to "spend time observing and listening to children and interacting with them [and are] sensitive to the uniqueness of each child" (**p. 13**). Indeed, at the beginning of the curriculum, some approaches to learning are identified which provide a degree of insight into the role of the adult, for example, in the Foundation Stage section of the curriculum, which states that "early years practitioners are committed, sensitive, enthusiastic and interact effectively to challenge children's thinking and learning". (**DENI, 2007a, p. 19)**

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There is less specific information about the role of the teacher in Key Stage 1 and 2, apart from the implicit 'enabling' noted above.

What are the main differences between preschool and school?

As is perhaps to be expected, there is a much more child-centred perspective in the pre-school, as indicated within the content of the pre-school curricular guidance.

4.6 Materials and Resources

What are the key summary points?

There is limited reference to particular materials or resources that teachers should use in the curricular documents – certainly there are no 'official' textbooks for the country, nor specific guidelines about what should be taught from this perspective.

In science education there is little guidance – there appears to be little mention of specific materials that children should be using; similarly in mathematics. While there is reference to, for example, children becoming adept at using money in the mathematics curriculum, or telling the time, clocks and money would not perhaps be considered as classroom resources per se.

This is similar in both the primary and early years documentation, with the only reference in the early years suggesting that "Children need access to a wide range of well-presented materials [that] will provide new and challenging experiences". **(DENI, 2006a, p. 14)**

4.7 Groupings

What are the key summary points?

There is very little that is particularly directive about how teachers should group their classes. As noted above, the main curriculum document suggests that teachers should "use a range of organisational approaches" **(DENI, 2007a, p.3)** in order to achieve educational goals, but there is little explicit guidance on how this might be done. Similarly, while the *Assessment for Learning* documents **(CCEA, 2009)**, for example, do suggest that children work well in pairs/groups, they do not provide recommendations on, for example, how often children should work like this. Similarly, there is discussion about how assessment may be done through self- and peer-assessment, implying that children may be grouped during class, however this does not go into great detail.

What are the main differences between preschool and school?

Most of pre-school education is structured around play-based activities perhaps allowing for a more flexible organisational structure, where may children play alone, in pairs or in small groups. In contrast, the primary school day is more structured around task-related activities; play in the Foundation Stage and primary education tends to be organised around the main Areas of Learning, with Literacy and Numeracy assuming priority. As it perhaps to be expected, there is more whole-class teaching in the older years, which is then broken down into activities appropriate to particular academic groups.

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4.8 Time

What are the key summary points?

In the curriculum there is no real discussion about the amount of time that should be allocated to the subjects. The curriculum recommends that the themes or questions raised in the 'World Around Us' are of learning may be integrated into other areas of the curriculum, suggesting that, "links should be made with the other Learning Area" and that "teachers should ensure that, where appropriate, aspects of the other Areas of Learning should be integrated" (**DENI, 2007a, p. 84**). Thus there is no specific guidance as to the amount of time that should be devoted to this Area of Learning.

While there is no particular guidance on times for teaching, the introduction to the Foundation Stage does implicitly provide some information about the structure of teaching mathematics;

> "Children should have opportunities to develop their understanding though guided mathematical activities, including open-ended tasks, *as well as activities in other Areas of Learning*." (**DENI, 2007a, p. 23, emphasis added**)

This implies that mathematics should be taught both discretely and within the other subject areas.

Looking to the supplementary documents that support the curriculum, they too have little guidance on how much time should be spent on the specific Areas of Learning. *Understanding the Foundation Stage* (**DENI, 2006c**) for example, suggests that all planning of lessons "should be regarded as flexible; teachers should alter or add to them as they observe the children's responses and the outcomes of play" (**p. 11**).

Similarly in Key Stage 1, looking at the *Planning for the Revised Curriculum for Key Stage 1 & 2* (**DENI, 2007c**), there is very little on actual amount of time that should be devoted to individual Areas of Learning. This is perhaps due to the emphasis that is placed on the links between different Areas of Learning.

Nevertheless, although the Revised Curriculum refers to a broad and balanced curriculum, in practice the priority has always been placed on literacy and numeracy Areas of Learning. More recent policy documents such as ***Every School a Good School*** (**DENI, 2009**) and ***Count, Read, Succeed*** (**DENI, 2011**) highlight the governmental emphasis on these particular domains.

What issues / tensions / policy criticisms exist?

Primary School teachers, in the main FS teachers, often refer to the problematic issues of time and ensuring that all areas of learning are appropriately addressed while at the same time allowing time for play.

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4.9 Assessment

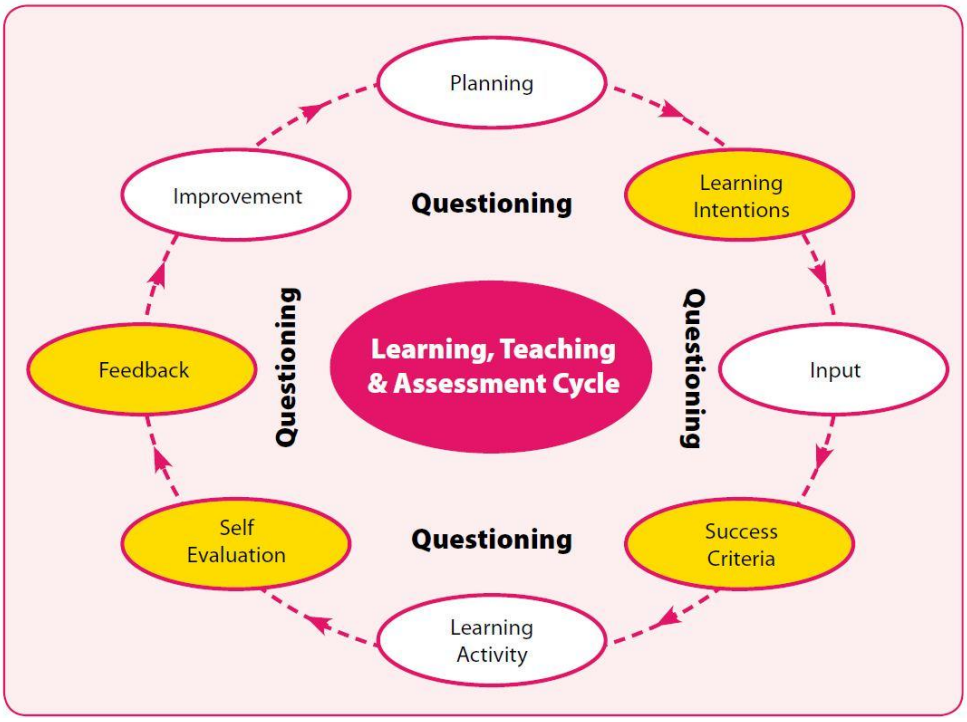
What are the key summary points?

Assessment is only briefly mentioned in the curriculum document and is considered implicitly, trough the levels of progression in each of the Areas of Learning, with clear mapping from as to how children's learning should develop as they go through the school life. At Foundation Stage and Key Stage 1, the emphasis is largely on formative assessment however there are national summative assessments at Key Stage 1 and 2 in literacy and numeracy. Indeed, it had been intended that the curriculum and the assessment approach should have been revised simultaneously but revised arrangements assessment are only coming into play in the coming academic year (discussed below).

Schools are encouraged to adopt the 'Assessment for Learning' approach to assessment as set out by the CCEA document **(CCEA, 2009)** in order to assess pupils' 'Levels of Progression', in Communication, Using Mathematics and Using ICT (note that 'using mathematics' is distinct from 'mathematics and numeracy' in the curriculum).

Assessment for Learning **(CCEA, 2009)** suggests that assessment has a number of purposes, including driving planning, informing both children and parents of progress and setting future targets. It encourages "giv[ing] children an active role in the assessment process" **(CCEA 2009)** thus making the assessment process meaningful for all those involved.

The process of assessment for the Foundation Stage is set out in the *Understanding the Foundation Stage* document (**DENI, 2006c**) and is reproduced here:



'The Learning, Teaching and Assessment Cycle' in the Foundation Stage (DENI, 2006c, p. 10)

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This cycle shows how, in the Foundation Stage, teachers are expected to use Assessment for Learning in ways to improve their teaching. It is the 'self-evaluation' phase illustrated here in which assessment plays the key role. The high level of observation required in assessment in the Foundation Stage enables the practitioner to evaluate their own practice through the quality of learning activities and subsequently improve upon it in future planning.

In terms of external accountability, there have been Key Stage 1 and 2 testing since 2007 in literacy and mathematics. Science is no longer seen as a core area of learning. This coming academic year will see these tests turn to compulsory online assessments, run by *'Rising Stars UK Ltd.'* for numeracy, in addition to online testing for literacy. The initial trial was completed in January 2012 and this is set to be rolled out nationwide in the 2012/2013 academic year. Further information on this can be found on the website: (http://www.nicurriculum.org.uk/key_stages_1_and_2/assessment/computer_based_assessment/news/18_04_2012.asp). Meanwhile, the computer-based assessment programme INCAS has also been a compulsory element of the assessment process up until this year as a formative assessment measure in Key Stage 2 in all primary schools. The new assessment arrangements are detailed on the CCEA website (*http:\\wwwnicurriculum.org.uk/key_stages_1_and 2\assessment*).

Two new providers for the Literacy and Numeracy computer-based assessments, as follows:

- Tribal Education Ltd. for the Literacy assessment; and
- Rising Stars UK Ltd. for the Numeracy assessment.

Looking to teacher education, the last four teacher competencies described in the Teacher Education Handbook **(DENI, 2010b)** all relate to assessment;

- Teacher Competence 24: "Teachers will focus on assessment for learning by monitoring pupils' progress, giving constructive feedback to help pupils reflect on and improve their learning." **(DENI, 2010b, p. 32)**
- Teacher Competence 25: "Teachers will select from a range of assessment strategies to evaluate pupils' learning, and use this information in their planning to help make their teaching more effective." **(DENI, 2010b, p. 33)**
- Teacher Competence 26: "Teachers will assess the levels of pupils' attainment against relevant benchmarking data and understand the relationship between pupil assessment and target setting." **(DENI, 2010b, p. 34)**
- Teacher Competence 27: "Teachers will liaise orally and in written reports in an effective manner with parents or carers on their child's progress and achievements" **(DENI, 2010b, p. 35)**

Assessment therefore seems to be a key part of teacher training at all levels.

What issues / tensions / policy criticisms exist?

While it may appear that it is only since the introduction of the new ***Northern Ireland Curriculum: Primary*** **(DENI 2007a)** that observation to inform teaching and assessment for

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learning have been emphasised but primary education, assessment has always been a core aspect of primary teaching in Northern Ireland.

Furthermore, and particularly in the older years of primary school, external formal assessment is still particularly important. While in policy rhetoric the selective education system no longer exists, from parental and most upper primary teachers' perspectives it is more active than ever. The grammar versus secondary school system is still in place, and while primary schools are not supposed to prepare children for this test but in most primary schools this is still happening and therefore preventing the revised curriculum to be implemented to its full potential.

What are the main differences between preschool and school?

As noted above, the main difference appears to be in mathematics/numeracy, where *Assessment for Learning* is central and applicable to all subjects in the Foundation Stage, while there is now an emphasis on external testing in mathematics in Key Stages 1 and 2. Teachers in primary schools are still encouraged to use assessment for learning techniques to inform their practice, however it seems that external pressures are now showing.

What are the differences, if any, between science and mathematics?

Assessment for Learning is implicitly applicable to all areas of learning, therefore there are few explicit differences in science and mathematics formative assessment. However, with the summative Key stage tests in mathematics, and science no longer seen as a core area of learning, there is a difference now from this perspective, especially with the change to the compulsory online assessment in numeracy and literacy.

There is no specific mention of science and technology assessment, however in the *'The World Around Us: Frequently Asked Questions'* document on the DENI website it suggests that "as with other Areas of Learning, a variety of methods should be used [in assessment]. Examples include verbal records, noted or photographed, written recorded work etc." As noted above, however, mathematics assessment is moving towards an online assessment model.

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5. Approaches to Teacher Education

The ***Osler Report*** **(2005)** outlined the four-staged structure of teacher education in Northern Ireland;

"In Northern Ireland, the broad field of teacher education is divided as follows;

- **Initial Teacher Education** describes the training of potential teachers in institutions of higher education who are either undergraduates pursuing a BEd degree or post-graduates taking a one year certificate in education (PGCE). These trainee teachers are the responsibility of their HEI. On completion of ITE, teachers leave with a Career Entry Profile (CEP) intended to act as a bridge to the next stage, Induction.
- **Induction** covers the first year of a teacher's employment after qualifying. Teachers are required to register with their Education and Library Board (ELB) for induction which they should do no matter what their employment status. During induction, teachers are the shared responsibility of their school, where a teacher-tutor will have regular contact, and their ELB whose Curriculum Advisory and Support Service (CASS) will provide support, guidance and in-service training as requested by the schools. The HEIs may also provide support or in-service courses. A further, less direct accountability for these teachers lies with the DE which sets their employment conditions.
- **Early Professional Development (EPD)** describes the training given to teachers in their second and third years of teaching. The school is the lead partner and is responsible for obtaining continuing support for the teacher. The teacher is required to complete 2 Professional Development Activities during these years. The school completes a 'summative report' to link the induction year to this second and third year experience. Training, as in the Induction year, will be provided by the ELB/CASS and/or HEIs.
- **Continuing Professional Development** describes the training of teachers throughout their careers after completion of the first 3 years."

(**Osler, 2005, pp. 3-4**)

According to the DENI website (*http://www.deni.gov.uk/index/school-staff/teachers-professional-development/4-teachers-teachereducationreview_pg.htm*, accessed July 2012, and ©2012) as a result of the outcomes and implications of this report, "The Department [of Education in Northern Ireland] is currently finalising a draft strategy and implementation plan for the future direction of teacher professional development". A draft report that supports many of the conclusions of the Osler report can be found in the slightly more recent ***Teacher Education in a Climate of Change: the Way Forward*** **(DENI, 2010c)** document however DENI's statement seems a little strange given the time between the Osler report being published and today. Nevertheless, the statement on the DENI website appears to be the most up to date information available.

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Nevertheless, there have been more recent documents published aimed at all those involved in teacher education process – student teachers, newly qualified teachers, schools and teacher-tutors and those involved in ITE/EPD. ***The Teacher Education Partnership Handbook* (DENI, 2010b)** provides information on ITE, the induction stage and early professional development (described above), as well as providing information on the 27 "teacher competences" required to qualify as a teacher. In addition to this, there is also a Q&A booklet on ***Professional Development of Beginning Teachers* (DENI, 2010d)** .

5.1 Initial teacher education

Initial Teacher Education is currently undertaken by six Higher Education institutions in Northern Ireland. There are five universities and one distance-learning university (Open University). Individuals wanting to become teachers can either choose the four-year BEd course or the PGCE – a one-year postgraduate course. Each teacher training course is largely specific to the institution but core feature of classroom-based practice, students observed by HEI tutor and an assigned teacher-tutor in school(s). There are 27 'teacher competencies' (outlined in the ***The Teacher Education Partnership Handbook* (DENI, 2010b)**,) that student teachers must achieve throughout their training, assessment of which is a mix of self-assessment, teacher-tutor assessment and HEI tutor assessment. The final stage of assessment is the '*Career Entry Profile'*, initially completed by the HEI, which outlines the achievements, strengths and potential areas for development of the individual during their time as a trainee. This profile continues with the teacher throughout their career and acts as a guide for further professional development in the future. Professional development undertaken during the induction, EPD and CPD phases of a teacher's career are all entered into this Career Entry Profile.

5.2 Continuing professional development

As described above, the training of teachers is structured into four stages, ITE, Induction, EDP and CPD. Technically, the role of the Higher Education Institute currently finishes with ITE, with schools being involved in all four stages. Induction, EPD and CPD are all assumed to be the role of the school and indeed no nationwide CPD policies were found in the available documentation.

However, the ***Osler Report* (2005)** recommends HEI playing a role in Induction, EPD and CPD. What that role may be is, according to the DENI website, currently under consideration.

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6. Summary

Science education in Northern Ireland features along with history and geography in one of the six Areas of Learning in the curriculum, described as 'The World Around Us'. It is also coupled with 'technology' in this context. The 'World Around Us' area of learning applies to each of the early years, the Foundation Stage and Key Stage 1 and 2 age phases and requires pupils to explore a number of different questions and statements that may be personally relevant to them. Mathematics is presented, in Foundation Stage and in Key Stage 1 and 2, as a list of statutory requirements. It is coupled with 'numeracy' in the curriculum, as the curriculum largely focuses on number. In contrast, in the early years, mathematics is presented as 'Early Mathematical Experiences' and focuses on developing understanding in a variety of different areas of mathematics, including 'number', 'shape', 'space', 'size and quantity', 'pattern', 'sequencing' and 'relationships'. These are to be developed through play and experimentation.

The Foundation Stage and Primary Curriculum are published in the same document. This is purposefully done in order to ensure a smooth transition and continuity from the early years into primary schooling – both in the World Around Us and in Mathematics and Numeracy, each Key Stage builds and refers directly to the stage before. The statutory requirements for state-funded early years education is published in its own document.

There are also a number of 'Thinking Skills and Personal Capabilities'. These skills are Managing information; Thinking, problem solving and decision-making; Being creative; Working with others and; Self-management. Each of these have a number of sub-skills that can be applied and developed throughout each Area of Learning in curriculum. It is through these TSPC that we see 'creativity' most clearly in the curriculum.

On the one hand, education guidance in Northern Ireland appears quite open. There is little prescription about how teachers must teach, and "flexibility" in teaching is emphasised throughout the curriculum in both key stages. It seems from the documents consulted that - the overall flavour of the Northern Ireland curriculum provides a large amount of freedom for its teachers. Teachers are encouraged to use *Assessment for Learning* in their day to day assessment of children's progress, while there is a less heavy emphasis on formal, externally-driven testing, particularly in Key Stage 1.

However, behind this open nature of the curriculum lies the prescriptive content of mathematics that must be taught, emphasised by the presence of both Key Stage 1 and 2 testing in mathematics that has been in place since 2007, and soon to be carried out online. The Thinking Skills and Personal Capabilities, too, could be interpreted as fairly prescriptive, given that there is a list of particular skills that practitioners should be encouraging in their class. How this manifests in the classroom will be interesting to observe.

Tensions identified within policy

In the time available, it was not possible to find a large amount of documentation on further tensions, however there were possible internal tensions that could be identified, described in

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the above sub-section. It will be interesting to see how the apparent differences between the openness of parts of the curriculum and the apparently more prescriptive mathematics curriculum play out in the classroom environment – whether in fact this prescription does affect teaching in a way that leads to one particular way, or whether the more general freedoms in the curriculum carry over into mathematics. Researchers have suggested that in fact curriculum content is what ultimately drives pedagogy, so it will be interesting to see how this pans out.

There has been much public criticism of the consultation document outlined proposed changes to early years provision, as outlined in the summary document published in July 2012. How this affects future developments can only be ascertained once the revised document(s) are published in November 2012, and which will be in place during the second phase of the study.

Main differences between preschool and school

The primary curriculum strives to ensure continuity and smooth progression from the Foundation Stage through to Key Stage 1. By publishing them in the same document, children's educational path in the primary school can be clearly seen. As such there are few fundamental differences between Foundation Stage and Key Stage 1 – subject areas are constructed in a similar fashion, with science coming under the 'World Around Us' area of learning in both age stages and the statutory requirements of mathematics following on from one another. The Thinking Skills and Personal Capabilities apply equally to both age groups (indeed all stages of education) thus no real differences can be discerned here, only how these may be put into practice, however without visiting classrooms or having any practical knowledge of this is difficult to judge this.

There may be a slightly stronger emphasis on creativity in the Foundation years of education, as it is stated as a more global aim than in the Key Stage 1 and 2 curricula, however again, how this evidences in the classroom remains to be seen.

Furthermore, it could be argued that the creation of the Foundation Stage in the primary school has eased the tension between pre-school and primary school. The continuation of Areas of Learning, such as the 'World Around Us' means that there is a smooth transition from pre-school to primary school learning and children are already in the habit of exploring the curriculum through asking questions.

Key differences between science and mathematics.

The main differences between the two are the way in which they are constructed in the curriculum. Mathematics is presented as a list of statutory requirements that children need to learn, while science consists of a number of questions and statements that children might explore. It is also important to note that these questions/statements are not limited to science and may also be explored within the context of the humanities, such as through history or geography.

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This highlights another difference in that while mathematics (and numeracy) is presented as its own 'Area of Learning' in the curriculum, science education is framed as 'science and technology' within the 'World Around Us' Area of Learning. As such, there may not be such an emphasis on science in the classroom and indeed the teacher could feasibly not discuss science in a way that we might recognise by approaching the particular areas for exploration from other contexts. Meanwhile, 'mathematics and numeracy' are to permeate the curriculum, and so play a central role in children's education.

Overview of ways in which inquiry-based and creative approaches are presented and related.

The notion of 'inquiry' is not dealt with explicitly in such terms in the curriculum, however 'exploration' is a repeatedly used phrase in the curriculum. Children are encouraged to explore propositions, statements and questions within the 'World Around Us' area of learning – indeed the curriculum states that "the purpose of [World Around Us] is to help children explore… from the perspectives of geography, history and science and technology" (**DENI, 2007a, p.83**), while at the Foundation Stage World Around Us is about "asking questions about why things happen" (**DENI, 2007a, p.85**).

The Thinking Skills and Personal Capabilities **(DENI, 2007b)** outlined perhaps present the best way example of both creativity and inquiry in Northern Ireland education. 'Being creative' sets out a number of skills;

- *seek out questions* to explore and problems to solve;
- *experiment* with ideas and questions;
- *make new connections* between ideas/information;
- learn from and value other people's ideas;
- make ideas real by *experimenting* with different designs, actions, and outcomes;
- challenge the routine method;
- value the unexpected or surprising;
- see opportunities in mistakes and failures; and
- take risks for learning.

(**DENI, 2007b, p. 5, emphasis added**).

Here we can see many of the features of both creativity and inquiry.

6.1 Limitations

The researcher carrying out the policy analysis was unfortunately not based in Northern Ireland and had little previous experience of the curriculum in the country. This places a number of possible limitations on the analysis and subsequent reporting of the evaluations.

Firstly, by coming to all the resources/documents from afresh, it was not possible to have the deep contextual knowledge that may have been afforded by a researcher based in Northern Ireland and had seen, or perhaps had experience of the documents being put into practice in the classroom. This meant that interpretations could only be made of the rhetoric, rather than any judgements of what was actually possible in the classroom.

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Secondly, the report relied on documents that were available via the web, such as the official DENI website and the CCEA website. We may question how reliable the websites may be – while what is published may be the most 'up to date' this is not to say there are still documents that are referred to by teachers, particularly non-statutory and guidance documents produced by, for example, quangos or teacher unions. Another question, which ties in with the first, is how the availability of documents for this study compares to documents available to teachers. If the teachers have extra publications in 'hard copy' that are not available on the web, then this report will be limited in its analysis and subsequent conclusions.

The lack of contextual knowledge and potentially limited documents were therefore the two main limitations. Attempts were made to mitigate these by contacting academics in Northern Ireland to verify the analysis, however as of the first submission deadline, these attempts had been unsuccessful.

Possible sources of bias

While every attempt was made to address potential issues, the limitations noted in the previous section lead to a number of possible biases in this report. By using only the statutory and guidance documents published on the official websites, this study will only present the picture as desired by the government/government agencies. It is possible that this is not what occurs in classrooms on an everyday basis. Of course, analysing a document for the first time presents an advantage, in that it provides opportunities for a fresh analysis that it not influenced by previous experience. However, in this case where the documents are so closely tied to practical application (i.e. to classroom teaching) this is less advantageous.

Unfortunately, little critical documentation could be found on the Northern Ireland curriculum, and therefore the report largely relies on government/government agency published documents. This is not, of course, to say that there is none, but that within the scope of the study, there was little to be found. While the tensions and internal inconsistencies can be highlighted, the views of the wider academic community are less represented here.

6.2 Implications

Travelling to Northern Ireland for in-depth study in classrooms provides an excellent opportunity to address some of the limitations and potential bias discussed in the previous section. It would allow teachers working in the specific country to have input on how the actual policy documents are put into practice, potentially highlight new or unknown documents that support/contrast/supersede those selected in this study.

The in-depth study will also be carried out in early 2013. This will be after the new early years strategy will have been published in November and thus the in-depth field study would allow us to interview practitioners to establish how it has been received as well as observe how it has been enacted in the classroom setting.

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- What opportunities and challenges are identified that may suggest recommendations for policy?

Northern Ireland seems to be in an unsure state in terms of education, with both early years provision and teacher training currently under government review. Whether this provides an opportunity or challenge for this study is slightly unclear. Recommendations for the early years are to be published in November 2012 however whether these recommendations are to be statutory is unclear. If not, then this provides an opportunity to have an influence in future; if so, and depending on the content, then it is unlikely that further there will be an openness on either a teacher or government level for further input. With regards to teacher education, there is little indication as to the direction that the Northern Ireland government appear to be heading – indeed whether the recommendations of the Osler Report are to be considered is not mentioned. It may be then that there is an opportunity here for recommendations for policy.

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Appendix A: Survey Ratings

Analysis of Approaches to Teaching and Learning

Key
E: Early (Preschool)
P: Primary

Rationale or Vision

Ai. What are the purposes of science Education?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. To provide a foundational education for future scientists and engineers				E/P
b. To develop socially and environmentally aware and responsible citizens				E/P
c. To enrich the understanding and interaction with phenomena in nature and technology			E/P	
d. To develop more innovative thinkers	E/P			
e. To develop positive attitudes to science		E/P		
f. To develop important attitudes and dispositions as a foundation for future learning				E/P

Aii. What is the emphasis, if any, on the role of creativity in the purposes of science Education? (Adapted from T survey Q23)

	Counter Creative Emphasis	No Creative Emphasis	Slight Creative Emphasis	Highly Creative Emphasis
a. To provide a foundational education for future scientists and engineers		n/a		
b. To develop socially and environmentally aware and responsible citizens			E/P	
c. To enrich the understanding and interaction with phenomena in nature and technology			E/P	
d. To develop more innovative thinkers			E/P	
e. To develop positive attitudes to science			E/P	
f. To develop important attitudes and dispositions as a foundation for future learning		n/a		

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Aims and Objectives

Ai. What views are indicated about the importance of the following Science learning outcomes?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. To know and understand the important scientific ideas (facts, concepts, laws and theories).				E/P
b. To understand that scientists describe the investigations in ways that enable others to repeat the investigations.	E/P			
c. To be able to ask a question about objects, organisms, and events in the environment.				E/P
d. To be able to employ simple equipment and tools, such as magnifiers, thermometers, and rulers, to gather data and extend to the senses.	E	P		
e. To know and understand the important scientific processes.	E/P			
f. To be able to communicate investigations and explanations.	E	P		
g. To understand that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.	E/P			
h. To have positive attitudes to science learning.				E/P
i. To be interested in science.	E/P			
j. To be able to plan and conduct a simple investigation.	E/P			
k. To have positive attitudes to learning.				E/P
l. To understand that scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).	E/P			
m. To be able to collaborate with other children			P	E

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Aii. What is the emphasis, if any, on the role of Creativity in the following Science learning outcomes?

	Counter Creative Emphasis	No Creative Emphasis	Slight Creative Emphasis	Highly Creative Emphasis
a. To know and understand the important scientific ideas (facts, concepts, laws and theories).		n/a		
b. To understand that scientists describe the investigations in ways that enable others to repeat the investigations.		n/a		
c. To be able to ask a question about objects, organisms, and events in the environment.				E/P
d. To be able to employ simple equipment and tools, such as magnifiers, thermometers, and rulers, to gather data and extend to the senses.		n/a		
e. To know and understand the important scientific processes.		n/a		
f. To be able to communicate investigations and explanations.			E/P	
g. To understand that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.		n/a		
h. To have positive attitudes to science learning.				E/P
i. To be interested in science.			E/P	
j. To be able to plan and conduct a simple investigation.		E/P		
k. To have positive attitudes to learning.			E/P	
l. To understand that scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).		n/a		
m. To be able to collaborate with other children				E/P

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Content

A. How are Science and Mathematics presented as learning domains?

	As its own learning area	**Encompassed within other social sciences (e.g. geography)**	**Encompassed within more general understanding**
Science		E/P	
Mathematics	E/P		

B. What are the key Science and Mathematics topics/strands/themes?

	Science	**Mathematics**
1	Interdependence	Understanding number
2	Place	Counting and number recognition
3	Movement and energy	Understanding money
4	Change over time	Measures
5		Sorting
6		Patterns and relationships

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Learning Activities

Ai. What activities are encouraged?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. Observe natural phenomena such as the weather or a plant growing and describe what they see.				E/P
b. Ask questions about objects, organisms, and events in the environment.				E/P
c. Design or plan simple investigations or projects.		E/P		
d. Conduct simple investigations or projects		E/P		
e. Employ simple equipment and tools to gather data and extend to the senses.	P	E		
f. Use data to construct reasonable explanations.	E	P		
g. Communicate the results of their investigations and explanations.	E/P			

Aii. What is the emphasis, if any, on the role of Creativity in the following activities?

	Counter Creative Emphasis	No Creative Emphasis	Slight Creative Emphasis	Highly Creative Emphasis
a. Observe natural phenomena such as the weather or a plant growing and describe what they see.			E/P	
b. Ask questions about objects, organisms, and events in the environment.			E/P	
c. Design or plan simple investigations or projects.		n/a		
d. Conduct simple investigations or projects		n/a		
e. Employ simple equipment and tools to gather data and extend to the senses.		n/a		
f. Use data to construct reasonable explanations.		n/a		
g. Communicate the results of their investigations and explanations.		n/a		
h. Other		n/a		

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Teacher Role / Location

Ai. What learning/teaching contexts and approaches are mentioned?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. Open/unstructured play				E/P
b. Role/Pretend play			E/P	
c. Drama	P		E	
d. Teaching science from stories	E/P			
e. Using history to teach science (e.g. transport, the work of scientists)			E	P
f. Working in small groups			E/P	
g. Physical exploration of materials			E/P	
h. Using outdoor learning activities			E/P	
i. Taking children on field trips and/or visits to science museums and industry			E/P	
j. Integrating science with other curricular areas				E/P
k. Building on children's prior experiences				E/P
l. Fostering collaboration			P	E
m. Encouraging different ways of recording and expressing ideas – oral, visual, digital, practical	E/P			
n. Encouraging problem finding – e.g. children asking questions				E/P
o. Encouraging problem solving – e.g. children solving practical tasks				E/P
p. Encouraging children to try out their own ideas in investigations				E/P
q. Fostering classroom discussion and evaluation of alternative ideas				E/P
r. Fostering imagination			E/P	
s. Relating science to everyday life	E/P			
t. Using questioning as a tool in science teaching			E/P	
u. Using digital technologies with children for science teaching and learning				E/P
v. Fostering autonomous learning				E/P

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Aii. What is the emphasis, if any, on the role of Creativity in the following learning/teaching conteEts and approaches?

	Counter Creative Emphasis	No Creative Emphasis	Slight Creative Emphasis	Highly Creative Emphasis
a. Open/unstructured play				E/P
b. Role/Pretend play				E/P
c. Drama				E/P
d. Teaching science from stories		n/a		
e. Using history to teach science (e.g. transport, the work of scientists)		E/P		
f. Working in small groups		n/a		
g. Physical exploration of materials		n/a		
h. Using outdoor learning activities				E
i. Taking children on field trips and/or visits to science museums and industry			E	
j. Integrating science with other curricular areas			E/P	
k. Building on children's prior experiences		E/P		
l. Fostering collaboration				E/P
m. Encouraging different ways of recording and expressing ideas – oral, visual, digital, practical		E/P		
n. Encouraging problem finding – e.g. children asking questions				E/P
o. Encouraging problem solving – e.g. children solving practical tasks			E/P	
p. Encouraging children to try out their own ideas in investigations			E/P	
q. Fostering classroom discussion and evaluation of alternative ideas		E/P		
r. Fostering imagination				E/P
s. Relating science to everyday life		E/P		
t. Using questioning as a tool in science teaching				E/P
u. Using digital technologies with children for science teaching and learning		E/P		
v. Fostering autonomous learning		P	E	

C. What, if any, Inquiry Approaches are discussed?

	A (Open)	B (Guided)	C (Structured)	N/A
a. QUESTION: Children investigate scientifically oriented question				E/P
b. EVIDENCE: Children give priority to evidence				E/P
c. ANALYSE: Children analyse evidence	E/P	P	P	
d. EXPLAIN: Children formulate explanations based on evidence	E/P	E/P		E/P
e. CONNECT: Children connect explanations to scientific knowledge	E/P	E/P	P	
f. COMMUNICATE: Children communicate and justify explanation				
g. REFLECT: Children reflect on the inquiry process and their learning				E/P

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Materials and Resources

A. What materials are suggested?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. Instructional materials (e.g. textbooks)	E/P			
b. Audio-visual resources	E/P			
c. Relevant library materials (e.g. story books)		P	E	
d. Equipment and materials for hands-on exploration in the classroom (e.g. magnets, building blocks)		P	E	
e. Equipment and materials for hands-on exploration outside the classroom		P		E
f. Computers		E	P	
g. ICT resources (e.g. computer applications)			E/P	
h. Other digital technologies (e.g. interactive whiteboard, camera)	E/P			
i. Budget for supplies (e.g. paper, drawing materials)	E/P			
j. Teaching support personnel (e.g. classroom assistant)	E/P			
k. Other support personnel (e.g. technical support)	E/P			

Groupings

A. What groupings, if any, are suggested for teaching Mathematics and Science?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
Individual work	n/a			
Pair work	n/a			
Small group work	n/a			
Whole class activities	n/a			

Time

A. How much time should be planned for teaching Science and Mathematics per week?

	Science	Mathematics	Evidence or comments
a. Less than an hour			
b. 1-2 h			
c. 3-4 h			
d. More than 4 h		E/P	
e. N/A (Please explain)	E/P		Science is taught within the context of 'The World Around Us' which is to be integrated throughout the other Areas of Learning. Therefore, it is not stated how much time should be devoted specifically to science education.

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Assessment

A. What purposes of assessment are included?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. To identify areas for improvement in your science teaching		E/P		
b. To identify aspects of the science curriculum that could be improved	E/P			
c. To identify ways to improve child science learning			E/P	
d. To monitor regularly individual children's or cohorts of children's progress towards a set of desirable science learning outcomes	E/P			
e. To inform parents of their child's progress in science		E/P		
f. To help group children for science instruction purposes	E/P			
g. To monitor year-to-year child progress in science	E/P			
h. To provide feedback to children about their progress in science	E	P		
i. To set targets with children for their own development in science	E	P		

B. What importance is given to of the following priorities for children's assessment in Science?
To assess the development of children's:

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. Knowledge and understanding of scientific ideas (facts, concepts, laws and theories)		E/P		
b. Knowledge and understanding of scientific processes		E/P		
c. Competencies necessary to carry out scientific inquiry		E/P		
d. Understandings about scientific inquiry (e.g. how science and scientists work)		E/P		
e. Positive attitudes and increase of interest in science	E/P			
f. Positive attitudes and increase of interest in learning science	E/P			

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C. What ways of assessing are advocated?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. Using checklists to record observations of children				E/P
b. During classroom interaction				E/P
c. Evaluating children's pictures, graphs etc which show their scientific reasoning		E/P		
d. Evaluating children's relevant gestures or physical activity	E/P			
e. Marking their homework		E/P		
f. Using authentic problem-based tasks	P			
g. Asking each child to reflect on their own learning and progress			E/P	
h. Using closed question tests	E/P			
i. Using open question tests				E/P
j. Using questions in context				E/P
k. Using portfolios (collection of evidence of children's work and progress)	E/P			
l. Children correcting each other's work and giving each other feedback			E/P	

D. What Creative attributes are addressed in assessment?

	Not Mentioned	Single Mention	Various Mentions	Emphasised
a. Sense of initiative	E/P			
b. Motivation	E/P			
c. Ability to come up with something new		E/P		
d. Ability to connect what they have learnt during your lessons with topics in other subjects	E/P			
e. Imagination				E/P
f. Curiosity			E/P	
g. Ability to work together				E/P
h. Thinking skills				E/P

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