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Abstract

Due to a movement towards the inclusion of the child's voice based on 'The New Sociology of Childhood', it is important to obtain the perspectives of children in relation to their views and experiences. To date there is little research on the experiences of children in Mathematics. This is an exploratory study into children's views and lived experiences of Mathematics in a first and second class primary school setting. The study consisted of five second class children (2 boys and 3 girls) and 17 first class children (9 boys and 8 girls). Using theoretical perspectives connected with the New Sociology of Childhood and informed by the UNCRC (2010), this study employs a participatory methodology to explore the voice of the child. Data collection comprised of circle time, a pictorial questionnaire and the use of a semi-structured discussion session based on a class story book comprising of the children's individual representations of Mathematics. Findings reveal that a number of factors influenced children's enjoyment of Maths. The use of concrete resources emerged as a key indicator of Mathematical enjoyment when working within all areas of Maths along with the importance of collaborative learning, positive feedback and parental support. Similarly the study found that there were a number of factors associated with a dislike of Maths, for example, ability level was identified as an influential factor during pair-work tasks, assessment and when carrying out problem solving tasks.

This research aims to contribute to the existing literature so as to identify best practice in Mathematics and to inform curriculum planning and assessment.

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Chapter One – Introduction and Rationale

1.0 Introduction and Rationale

The primary focus of this research is to provide the child with a voice, so as to obtain the views and experiences of the child in Mathematics in a primary school setting.
There is little known about the everyday experiences of children in primary school in relation to Maths and what their perceptions are of the educational provision provided. This is an exploratory study seeking to address this gap. The study will involve the co-construction of data by giving the children a voice. The purpose of the study is to identify what works best for the children but also in terms of what may inhibit learning from taking place within Mathematics.

Investigating children's perspectives and lived experiences in Mathematics through the use of a third person is a relatively new phenomenon (Garrick et al. 2010). It is hoped that this research will provide a deeper understanding of children's experience of Maths so as to inform curriculum planning and design, modify teaching methods and to inform curriculum assessment. Under the Irish National Teacher's Organisation (INTO) Discussion Document and Proceedings of the Consultative Conference on Education (2013) 'Numeracy in the Primary School' it is highlighted that the 'National Strategy for improving Literacy and Numeracy among children and young people' (2011) aims to sustain a strong emphasis on the development of numeracy skills throughout the curriculum. This was based on Pisa (2012) statistics indicating that there are a considerable number of pupils who do not attain adequate standards in Mathematics, whereby Ireland has fallen behind the OECD average in performance (OECD 2013). The results indicate the need to address underachievement. It was identified that Mathematical anxiety is a contributing factor to underperformance resulting in a decline in students' self-concepts and self-efficacy (OECD 2013). Children's experiences of assessments in terms of results, particularly among girls, were identified as a contributing factor to Maths anxiety (PISA 2012). The role of the teacher is identified as important in helping to establish and create an environment that helps reduce 'Maths anxiety' among children (Buckley 2013). This suggests that there are problems facing children in Maths and that children may not like Maths. Due to their being little research as to why children do not like Maths it is therefore important that we obtain the experiences and perspectives of the child by giving them a voice.

Chapter Two - Literature Review

2.0 Introduction

The purpose of this chapter is to outline key developments in law, policy and practice regarding the rights of the child and to identify the influential factors associated with teaching Mathematics in primary school. The chapter begins with a summary of Mathematics in the Primary School Curriculum. This chapter will also provide an overview of the drivers underpinning this. Teacher's perspectives and best practice in the teaching and learning of Mathematics will also be discussed. The researcher will provide an insight into the influencing and contemporary factors that are associated with Maths delivery, along with children's perspectives in relation to teaching and learning in Mathematics.

2.1 Overview of Mathematics in the Primary School Curriculum

The National Council for Curriculum and Assessment (NCCA 2007) identifies the many strengths and challenges that are associated with the current Primary School Mathematics Curriculum (DES 1999). Reviews have since revealed the need for an innovative Primary Mathematics Curriculum (NCCA 2014). These changes are identified in the draft plan as a result of the 'NCCA's Research Reports Series' (NCCA 2014). The new Primary Mathematics Curriculum (draft plan) emphasises the importance of child-adult interactions by building upon the principles that are central to the teaching and learning of the current Early Childhood Curriculum framework, Aistear (NCCA 2009). An emphasis will be placed on suitable playful educational practices (NCCA 2009) with the overall aim of promoting positivity in terms of Mathematical dispositions. It is therefore viewed that the new Primary Mathematics Curriculum will allow for interactions among teachers and children through play based methods (NCCA 2016). The revised curriculum will take into account the main considerations set out in the Literacy and Numeracy Strategy (2011). Under the INTO's report 'Numeracy in the Primary School' (2013) it is reported that some pupils enter post-primary school lacking the essential Mathematical skills emphasising the need for the development of stronger Mathematical foundations at primary-level. The rationale for change, as identified in the Mathematics draft plan (NCCA 2016), identifies the need to equip children with the confidence and skills needed to build such Mathematical foundations from

an early age. This therefore highlights the importance of identifying what children deem to be important factors in aiding their learning.

2.2 Drivers underpinning the rationale for change in curriculum design

2.2.1 Change in Education and Societal developments

As identified in the NCCAs (2016) 'Background Paper and Brief for the development of a new Primary Mathematics Curriculum' there was a need for change due to developments and change in education and society. It was identified that there was a lack of interconnectedness between assessment and lesson content, the need for an emphasis placed on pedagogy that facilitates talking through problems with peers, and the need for teachers in becoming skilled in the use of concrete resources. This is supported further under the 'Strategy for Improving Literacy and Numeracy among Children and Young People' (2011) whereby vital points are identified for the improvement of Mathematical standards in schools. Namely, assessment and enrichment of teaching skills were identified.

According to Gavosto et al. (1999) there are bigger demands placed on Mathematical education due to the competitive world and evolving technology. Warick and Howard (2015) found that 40% of employers had reported that their employees did not possess even the most basic Mathematical skills. In consultation with stakeholders, teachers and children, the new Primary School Mathematics Curriculum (draft plan) therefore aims to equip children with the necessary skill set that is required for them to be able to competently participate and engage in 21st century life (NCCA 2016). This requires a change in pedagogies which is identified in the new Mathematics Curriculum (draft plan) with the possibility of changing the learning experiences of children to help combat negative perceptions associated with Maths. Singh et al. (2002) highlight the importance of teachers in creating a curriculum that is relevant and creates meaning for children. In their study they highlight the importance of educators having the potential through appropriate curriculum design in encouraging and arousing a further interest in this subject area through improved practice. This current study aims to address this by identifying methods of teaching that arouse interest and stimulate curiosity in Mathematics through the voice of the child.

2.2.2 Policy Context – Children's rights (Providing the child with a voice)

The 'United Nations Convention on the rights of the child' was established in 1990. Under article 44 of the convention it states that states parties are to report on measures that they implement so as to enhance children's rights and to also report on progress made in relation to such measures. In 2013 Ireland produced its 'Consolidated third and fourth report' to the United Nations Committee. Key areas in improving literacy and numeracy were addressed in the second report. These key areas were published in 2011 by the Minister for Education and Skills under 'The National Strategy to improve Literacy and Numeracy among Children and Young People, 2011-2020'. One of the six areas addressed in this strategy is the focus of working towards the development of numeracy in schools.

One of the general principles under article 12 of the 'United Nations Convention for the rights of the child' is that children's views must be taken into consideration in relation to any matter that affects him or her (Lundy 2007). There is a need for dialogue with children to listen to and make sense of a child's world so instead of reviewing one's own practices through observations it may be more beneficial to focus on methods that promote the rights of the child by giving them a voice (Sommer et al. 2013). White et al (2010) are also in agreement with this by stating that effective communication and the employment of methods that help reduce the power differential between the child and the teacher can result in meaningful insights into the thoughts and feelings of children.

2.2.3 The importance of viewing children as active agents in their own learning - New Sociology of Childhood

New perceptions on childhood have emerged over time (Danby and Farrell 2004). Sociological theory has impacted such perceptions arguing in favour of a change of outlook in relation to the child. According to Danby and Farrell (2004) the developmental perception views the child as developing into adults over a period of time. Childhood sociology disputes this view (Matthews 2007). According to Matthews (2007) the new sociology of childhood sees children as active agents in their own learning through the active role that they play in making sense of their worlds. This approach is referred to as the sociological approach. Researchers who work within this framework 'The Sociology of Childhood' refer to the importance of children playing an active role in constructing their social situations (Danby and Farrell 2004). This approach brings about change in terms of how the child was viewed

prior to the new sociology of childhood. Quennerstedt and Quennerstedt (2013) highlight this importance in terms of the study of children. For example, children themselves are able to actively participate in such studies that relate to their views or experiences. Matthews (2007) emphasises the need for studies that allow for the child to provide their experiences by giving them a voice. Researchers of the new sociology of childhood emphasise the importance of listening to children's views of their own experiences in comparison with that of an adult's opinion of children's experiences (Matthews 2007). This therefore requires careful thought in relation to the collection of data with an emphasis placed on data collection methods that promote conversation (Matthews 2007). This reinforces the importance of the current study whereby a triangulation of methods will be employed.

2.3 Literature regarding teacher's perspectives, attitudes and beliefs towards the teaching of Mathematics

Muijs and Reynolds (2015) identifies primary school teachers as holding different beliefs in relation to the teaching of Mathematics and that such beliefs impact on the effectiveness of the teacher, which in turn has an impact on student achievement. Under the INTO's consultative document 'Numeracy in the Primary School' (2013) it is emphasised that the teacher is key to fostering long term positive attitudes by creating an environment that provides a means for real life challenges, and in such a way that children feel that they are heard. Results from the TIMSS 2011 (NCCA 2016) place Ireland at a below average ranking in Mathematics internationally and suggest that this may be attributed to the teaching of children in Maths at primary school level. Knaus (2017) found that children are capable of grasping Mathematical concepts from an early age but the negative attitudes and lack of curriculum knowledge from educators in preschool settings impact heavily on the Mathematical experiences of young children. Geist (2015) concurs with this idea and identifies social factors as contributing to Mathematical anxiety whereby a teacher questions his or her own ability based on their own previous Mathematical experiences. He also argues that this can result in children experiencing a negative Mathematical environment from a young age.

Gavosto et al. (1999) highlight the importance of a two way communication process between educators and Mathematicians. This involves a collaboration process of designing

Mathematical courses with Mathematical scientists and educators from both primary and secondary education. The 'Strategy for Improving Literacy and Numeracy among Children and Young People' (2011) emphasise the need for teacher training colleges to provide access to students of high ability as it is acknowledged in the strategy that teachers themselves play a crucial role in the development of Mathematical skills in their pupils.

Like Knaus (2017) and Geist (2015), Dunphy (2009) found that teachers' thoughts and beliefs play an important role in their teaching of Mathematics. She sought to identify the challenges and difficulties facing teachers (from their perspective) who teach four and five year old children. A challenge revealed included the difficulty of engagement of children in 'problem solving'. Dunphy's (2009) research is of relevance as it could be used as a starting point for further study in this area, but from the perspectives of children. Her method of using a questionnaire could have been strengthened with the adoption of 'multiple methods' so as to provide an element of reliability. However, Dunphy (2009) ensured that her research questions addressed the main issues affecting teachers by developing them after a critique of the literature. The results were also limited to teachers of junior and senior infants (4 to 5 year olds). There is a lot of research on the perspectives of teachers however there are a limited number of studies in relation to children's experiences in Maths. This highlights the need for children's' views to be voiced from an early age with a focus on the adoption of pedagogies that children highlight as beneficial to their learning.

2.4 Literature that identifies best practice in Mathematics

2.4.1 Literature that identifies the importance of communication among children and instructional practices in supporting learning in Mathematics

Hanrahan (1998) posed the question that most educators want to know, what promotes or inhibits learning from taking place?

Henning et al. (2012) like Dunphy (2009) address the significance of 'talk' by referring to the importance of communication in Mathematics. Similarly, Mtetwa (2005) stresses the importance of 'communication' within the Mathematics classroom whereby the effectiveness of the classroom is influenced by questions used and discussion of explanations among children. Linder et al. (2015) in their study identified similar instructional practices as impacting positively on motivational levels but their results are restricted to the perceptions of 'highly motivated' children. However, according to Hufferd-Ackles et al. (2004) the

engagement of children in conversations and the provision of opportunities to express their ideas openly may pose as a challenge for educators. They stress that it can become difficult for educators to control the course that instruction takes and that children may make incorrect Mathematical choices.

In attempting to gain the views of young children in terms of how they view their role in an 'interactive' Mathematical environment, Pratt (2006) addresses the importance of listening to the views of the child so as to provide insightful information into the learning experiences while Hopkins (2008) identifies the voice of the child as a means towards school improvement. Although Pratt's (2006) study was carried out in an 'interactive' Mathematical environment, its relevance lies on the emphasis that is placed in obtaining the children's view of the role they themselves play. Results of the study (n = 34) from grade 3 and 4 (7 to 9 year olds) and from grade 6 (10 to 11 year olds) showed that children from grade 6 placed a strong emphasis on the importance of being provided with the opportunity to 'listen' to others. Grade 3 and grade 4 children were not as clear as to how 'talking' and 'listening' add to the learning process, rather they commented on the interactions that takes place with their teacher. Video recordings provided a means for the children to reflect on their engagements during tasks, however, the results of the interviews that ensued may be influenced or affected by the power differential that exists during an interview situation. Children were also paired during the interview stage, which according to Bragg (2007) can influence children's responses, by saying what they feel others want to hear. The relevance of the above studies lies in the importance of 'communication' among peers but however fails to address the views held by children of different ability levels. According to Hopkins (2008) there may not be enough attention given to listening to the child's perceived view of effective classroom conditions. This highlights the relevance of this current study which focuses on the importance of children feeling listened to which may result in increased Mathematical engagement (Hackenberg 2005).

Povey (2010) speaks of social justice practices in Mathematics. Widening the 'social space' provides a means for dialogue and equity for all children through group-work and pair-work (Povey 2010). These results highlight the significance of Dunphy's (2009) work whereby she refers to the importance of moving away from individual work to providing opportunities for investigations and discussions that are of interest to children. However, Galton et al. (2009) refer to the importance of 'structured instruction' for children who worry about Maths as they feel that group-based tasks may not benefit such children. They also identified mixed ability

groupings as impacting negatively on the learning process whereby children who are uninterested may pose as a distraction for other group members. Kutnick et al. (2007) associate this form of learning with the possibility of children withdrawing from the learning when group learning does not accommodate individual needs. Mercer (2000) highlights the need for children to be taught effective communication skills in order for group-work to be successful, suggesting that a lack of enthusiasm ensues in the implementation of such forms of learning.

2.4.2 Literature regarding the use of concrete resources in Mathematics

Fyfe et al. (2014) identify the many benefits associated with the use of concrete resources in supporting best practice, namely, enhancing understanding, aiding the construction of knowledge of nonrepresentational concepts and stimulating real life understanding. However, Fyfe et al. (2014) feel that concrete resources should be faded out over a period of time towards the use of more abstract resources. Their study is based on preschool and primary school children. They feel that the learner will benefit from this solid framework initially while also supporting them to become more abstract thinkers. The study is relevant in that it provides the theoretical advantages of this method of the 'fading' out of concrete resources but only from the view of educators in seeking ways to enhance and to generate more abstract learners. In contrast to this, Petersen and McNeil (2013) like Kaminski et al (2008) argue that there are mixed views in relation to the adoption of concrete resources in teaching and learning. They refer to such resources as a distraction whereby children view them only as objects rather than what it is that they actually represent due to the physical appearance or 'richness' of such resources. Petersen and McNeil (2013) suggest that it is important for teachers to use plain resources rather than a variety of rich resources in the classroom. This is supported by a study carried out by McNeil et al. (2009) with fourth (9 to 10 year olds) and sixth (11 to 12 year olds) grade children when testing their performance using either rich materials (real life bills/coins), plain materials (numbers on paper) or no materials. They identified the use of plain materials as well as using no materials as impacting positively on performance over the use of rich materials. The use of rich materials acted as a distraction for the children.

Burns and Hamm (2011) carried out a study on third (8 to 9 year olds) grade children (n= 91) and fourth (9 to 10 year olds) grade children (n=52) to identify the effectiveness of concrete resources in comparison with computer-based resources in Mathematics. Overall their study

revealed that children who worked with concrete resources performed slightly higher than the computer-based group. Their method of comparing the effectiveness of such resources in comparison with ICT cannot be justified as the computer-based group of children had to then perform a test using pencil and paper. However, their study highlights the need for constructive alignment between what and how a unit of work is taught and how it is assessed along with research that highlights children's views in relation to a lack of everyday concrete resources when carrying out tests (Biggs 2003).

2.4.3 Games in Mathematics

Enjoyment in Mathematics can be related to the use of games that promote positive attitudes (Bragg 2007). According to Bragg (2007), this can be attributed to the ease of which children can engage in such tasks and the feeling that is associated with success. Bragg (2007) in his study reported on interviews that were conducted with 210 children aged 9 to 11 years. Bragg (2007) found that through the use of games, some children were able to overcome Mathematical hurdles. Perspectives in terms of proficiency had increased for some children when playing games. The results of her study highlight the many benefits associated with games in Mathematics but it also highlighted that only some children reported that they felt they were learning from engaging in games. Ke and Grabowski (2007) highlight the importance of incorporating games to promote learning while Hall and Higgins (2005) suggests that there seems to be a fixation among children with using games in Maths lessons. Their concern is that children may associate games from the home environment with enjoyment rather than purposeful and structured class-based games. Bragg's (2007) study fails to identify whether games are used as a starting point or as a finishing strategy at the end of lessons. It is therefore unknown if lessons are conducted with the sole use of games or if lessons contain a combination of traditional based tasks with game playing. This current study will hopefully identify the role that Maths games play in the learning of structured Maths lessons for this group of first and second class children.

2.5 Contemporary issues that impact Mathematical delivery in the primary classroom

2.5.1 Literature regarding the difficulty associated with reading and understanding word problems

Results from PISA 2012 (OECD 2013) show that 31 per cent of 15 year old children worry about problem solving tasks with 30 per cent reporting that they feel helpless. PISA (2012)

results stress the relevance of seeking children's perspectives on Mathematical tasks so as to adapt methods of teaching to help reduce feelings of helplessness (OECD 2013). According to Vilenius-Tuohimaa et al. (2008) problem solving in Maths is revealed as an area of concern. In their study they identified 'technical reading fluency', comprehension skills and parental education as a predictor of a child's problem solving ability in Mathematics. The method adopted, that of a 'technical reading and comprehension test' provides a foundation for educators in identifying an area of concern in Maths. However, additional factors that may impact on enjoyment of problem solving or lack thereof also need to be addressed. This, like Dunphy (2009) provides a basis for further research into this area. However, Gersten et al. (2005) point to the educator in underestimating the time-frame in which it takes children to effectively implement newly taught strategies. According to Gersten et al. (2005) this impacts on instructional practices. Fuchs et al. (2009) refer to the importance of instruction practices that accommodates all ability levels. They suggest that such instructional practices need to take the form of detailed schema for each problem type. In comparison, Fyfe et al. (2014) point to the significance of working with concrete resources, to then working with pictures and finally abstract numbers and symbols for all problem-based tasks. They believe that this will help build a mental image of the problem when working without concrete resources. Like Fyfe et al. (2014), Jonassen (2003), refers to the importance of visualising the data.

2.5.2 The impact of Assessment Practices on Mathematical Motivation and Performance

There are many motivational aspects seen as having an impact on the learning of Mathematics (Anuola et al. 2006). Deci et al. (1991), for example, has highlighted interest and intrinsic motivation while Bandura (1993) illustrates self-concept and self-efficacy as impacting the learning process. They believe that these motivational factors are to an extent within the control of the educator. As opposed to this, Chang (2012), like Melhuish et al. (2008) identify the home environment as impacting on effort and belief in achievement. They believe that such socio-economic factors are outside the control of educators. In a study carried out by Anuola et al. (2006) it was found that there needs to be an emphasis placed on 'intrinsic' motivation. Anuola et al. (2006) identified a positive correlation between classroom activities that stimulate a child's motivation to learn and increased performance levels. However, there were limitations to the method that was used in their research. The method was limited to a ranking system whereby children were asked to rank their feelings

on different areas of Maths. This does not provide a means to elicit reasons as to why children may like or dislike a particular area in Maths.

In contrast, Povey (2010) associates performance with 'ability'. Povey (2010) believes that assessment is linked to performance which in turn impacts motivational levels. This label of 'ability' impacts on how a child thinks about and talks about Mathematics. Guay et al. (2003) suggests that the belief that one has in relation to competence impacts positively on overall attitude and thinking towards Mathematical achievement. Contrastingly, Yeung (2011) cited in Pinxten et al. (2014) reported that Mathematical enjoyment is the determining factor in relation to the amount of effort that a learner will put into Mathematical tasks. Povey (2010) believes that the focus should be placed on the idea that 'effort' results in competence.

Educators are better able to make predictions in relation to test results rather than children's motivational levels or anxiety levels when doing tests (Urhahne et al. 2011). Like Clarke and Shinn (2004), Bond and Ellis (2013) and Phelan et al. (2011) focus on the importance of formative assessment measures that are integrated into everyday lessons rather than stand alone assessment methods that can be viewed upon as judgmental in nature. They identify formative assessment as impacting positively on achievement and motivation, whereas Hackenberg (2005) views this as a challenge for children when being provided with feedback that is of a constructive nature.

2.6 Literature regarding children's perspectives in Maths and the factors that are associated with Mathematical anxiety

While Warick and Howard (2015) identify previous negative Mathematical experiences as being associated with the lack of interest in studying Mathematics in Higher Education, contrastingly, Wang et al (2014) place an emphasis on genetic factors in terms of cognition and anxiety. Beilock and Willingham (2014) reported that 50 per cent of six to eight year old children demonstrate Maths anxiety symptoms resulting in lower levels of achievement. There is a wide range of literature on Maths anxiety and the effects that this has among adults and adolescents but there is a lack of such research on children and reasons that contribute to Maths anxiety (Jameson 2014). Maths anxiety relates to: "tension and anxiety that interferes with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations" (Richardson & Suinn, 1972, p. 551). PISA (2012)

results, (OECD 2013) reported that 59 per cent of 15 year olds across OECD countries feel emotional strain and helpless when working on Maths activities. It was also reported that 61 per cent are concerned about Maths results. Ashcraft and Krause (2007) refer to the effect of such anxiety as impacting overall Mathematical performance due to anxiety levels consuming a significant amount of working memory that would otherwise be needed for general problem solving tasks.

Larkin and Jorgensen (2016) engaged in a study which sought to identify the attitudes and emotions of grade 3 (8 to 9 year olds) and grade 6 (11-12 year olds) primary school children towards Mathematics. To overcome the problem of bias and the idea of power differential, they used a method whereby children recorded their diary entries using iPads. They found that the children from both year groups expressed mainly negative comments towards Mathematics. Some children perceived Mathematics overall as difficult and for others specific areas such as basic operations along with teacher explanations contributed to difficulties experienced by the children. The method that they used for data collection provides a means for children to record their own feelings. However, this method has its limitations. While children are free to open up and voice their opinions, there is no opportunity given for 'discussion' whereby concerns and dislikes can further be explored in collaboration with the children. Also, the method failed to ensure that all participants recorded their thoughts consistently with some of the children recording their thoughts only once throughout the data collection process. I would question whether this method would enable children to freely communicate their thoughts during Maths lessons on a daily basis. According to Larkin and Jorgensen (2016) children have already developed these negative feelings by the end of their primary school years. The importance of this research is reflected on the emphasis that is placed on the time frame by which children have developed negative feelings towards Mathematics. Krinzinger et al. (2009) place a stronger emphasis on the starting point of Mathematical anxiety stating that it starts as early as first grade (6 to 7 year olds). These results support the need to provide children with a voice from an early age.

2.7 Conclusion

This chapter provided an overview of the new Primary School Mathematics Curriculum (draft) and an overview of policy documents that uphold the rights of the child. A review of the literature underpinning the need for change, in the context of teacher perspectives,

educational and societal changes while identifying best practice in the teaching and learning of Mathematics was discussed. It also examined literature that highlights problems associated with the delivery of the Mathematics curriculum in the primary school setting. The importance of considering the perspectives of children was examined along with the importance of viewing children as active agents in their own learning.

In summary, there is a need for research that represents the thoughts and experiences of children themselves through methods that allow for conversation. This study therefore aims to address this gap through the adoption of a methodology that allows for freedom of expression through the co-construction of data and which also upholds the rights of the child through active engagement and through the expression of thought.

Chapter 3 - Methodology

3.0 Introduction

This chapter of the study begins with the aims and objectives and rationale for the research. The methodological approaches to the study will be explained and the stages of the study will be described in detail. A philosophical justification will be given and choice of methods will be explained. The research tools that were used to meet the aims and objectives of this study will also be described. A description of the sample size and the strategy adopted follow from this. Issues regarding reflexivity along with validity and reliability of the study are also addressed. Finally, a description of the pilot study and the method of data analysis along with limitations and ethical issues concerning the study will be addressed in this chapter.

3.1 Research aims and objectives

The aim of this research is to listen to the children's view and lived experiences of Mathematics in a first and second class setting. There is little known about the everyday experiences of children in primary school in relation to Maths and what their perceptions are of the educational provision provided. This study seeks to address this gap. This will be achieved through the following research questions.

- Are there particular aspects of Maths that children like?
- Are there particular aspects of Maths that children do not like?
- What are children's lived experiences of Maths in the primary classroom?

The researcher hoped to gain a deeper understanding of children's experiences of Maths to inform curriculum planning and design, modify teaching methods, to inform curriculum assessment and to give children a voice in the classroom.

3.2 Rationale

As the researcher reflected upon her own learning experiences as a child she felt that it was structured lessons that dominated the Maths environment. Such lessons did not promote the ability to engage in discussions, games or group-based tasks. The researcher felt that book-

based tasks without the use of the above methods resulted in a lack of interest and disengagement. As the researcher now reflects on her own experiences as a teacher, she feels that the current Mathematics curriculum promotes the use of teaching pedagogies that allow for the promotion of learning through active and collaborative learning involving the use of play-based methods. However, the researcher had noted from her own observations, that at times the children seemed disinterested during Maths lessons. It was also clear that concentration levels were low for some children during different stages of lessons.
It is important for the researcher to identify the factors that the children themselves deem to impact their learning in a negative or positive way. This is also important for future planning of Maths lessons and implementing Maths pedagogies that children deem as interesting on a more regular basis.

3.3 Philosophical justification

The research onion as described by Saunders et al. (2012) was used to provide structure to the methodology chapter. Consideration was therefore given to the philosophy underpinning this research. Compton and Jansen (1990) refer to the importance of considering epistemology as this is significant for the selection of suitable tools in the acquirement of knowledge. Sowell (1987) as cited in Mc Niff (2014) identifies two types of visions, referring to them as either 'constrained' or 'unconstrained'. Sowell (1987) highlights the notion of an 'unconstrained vision' as drawing on a 'transformational epistemology' which queries everything in order to disclose any hidden underpinnings. This 'unconstrained' vision aims to identify new thoughts and ideas. This directs the researcher towards the adoption of an interpretive approach whereby the researcher will question everything so as to ensure validity of one's own interpretations.
The interpretive paradigm involves an understanding of 'human experiences' (Cohen et al. 2011). Cohen et al. (2011) refer to this as understanding from within the person. According to Atkins and Wallace (2012) the interpretive approach is one which is suited to a small scale study in educational research. Darbyshire et al. (2005) argues that while quantitative methods are important, they cannot provide the necessary insights and information needed to gain an understanding of children's perspectives. According to Silverman (2010) gaining an understanding of 'experiences' is a feature of qualitative studies. An interpretive approach allows for the researcher to not just obtain descriptions but goes further to identify reasons

why, which in turn will help reduce the possibility of subjectivity within the study (Atkins and Wallace 2012). The adoption of the interpretive paradigm according to Mc Niff (2014) allows for the explanation of reasons as the participants are provided with the opportunity to tell their own story.

3.4 Methodological Approaches to Research

Gioia et al. (2013) suggests that an interpretive approach leads to inductive reasoning whereby new concepts and theories are identified. Cohen et al. (2011) state that interpretive researchers aim to understand people's behaviour, thus the theory becomes an emergent process which provides understanding and insight into people's behaviours. The reason for this study being inductive in nature is due to the research questions posed, that of wanting to gain an insight into the children's experiences and perspectives in Mathematics. A participatory approach was used to obtain data using play based methods which builds on children's strengths, capacities and interests (Collins 2013). Atkins and Wallace (2012) highlight the issue of 'power differential' and how this is not only an ethical consideration but also has methodological implications. In order to minimise the impact of the researcher's presence during data collection a teddy named 'Bear' was used as a third person for the children to open up to and express their thoughts and feelings to (see image 1.) (Appendix 1: The Story of Bear).

Image 1

The study was divided into three stages. This entailed, circle time (co-construction of data), a pictorial questionnaire and semi-structured discussion sessions based on the class picture book that the children compiled based on their thoughts and opinions of Mathematics. The research incorporated Jenny Moslely's guidelines for circle time resulting in seven and eight children per grouping. The researcher also kept field notes throughout the data collection process.

'Bear' was a new addition to the class for the duration of the project and was used throughout the 'three stage' process for data collection. 'Bear' signified the starting point of the research project for the children. A 'thank you' card from 'Bear' to the class signified the end of data collection.

The class was divided up into three groups, labelled a, b and c for all of the three stages. Children were grouped by the researcher based on their characteristics (shyness/talkative/observant). The purpose of such groupings was to provide all children with the opportunity to be able to express their thoughts and feelings whereby they felt comfortable to be open and honest. Interactions that promote positive attachments helps build trust and the confidence that is needed for children to look at and explore their environment (TUSLA 2013). 'Attachment theory' associates positive relationships with a child's ability to feel comfortable in expressing their thoughts and feelings (TUSLA 2013).

3.5 Stages involved in the study

The study was divided into three stages. The research was carried out over three weeks so as not to impede on curriculum plans and children's daily learning.

Stage 1 (week one) – Circle time (Three circle time sessions comprising of 15 minutes per group)

Stage 2 (week two) – Pictorial questionnaire (whole class comprising of 15 minutes in total)

Stage 3 (week three) – Picture book (drawing pictures for the class story book (whole class) comprising of 25 minutes in total) and three circle time sessions for the semi-structured discussions comprising of 20 minutes each.

Stage 1

Circle Time

The researcher followed Jenny Mosley's rules for circle time – Small groupings (n=7/8) along with the talking stick so as to ensure that all children got an equal chance to express their thoughts/feelings to questions posed by 'Bear'. Each group engaged in one circle time to introduce 'Bear' and to answer questions posed by 'Bear' in relation to the children's experiences in Maths (Appendix 2). Field notes were generated so as to create a theme board and the researcher took notes during circle time. This method allowed for the co-construction of data. 'Bear' then informed the children that a post-box was set up in the classroom and that he would like them to write down any other thoughts or feelings that they might have about Maths throughout the week. The children were informed that they could use keywords, pictures and/or sentences. Children were also informed that this was anonymous.

Stage 2

Pictorial Questionnaire

Children shared their perspectives on Maths by indicating their likes or dislikes for particular areas in Maths (Appendix 3). The researcher read the statements/questions aloud to the children and they indicated their response by colouring the face that matched their feelings (like/dislike/unsure). The questions used were based on the researcher's personal observations during Maths lessons and from the literature associated with PISA 2012 (OECD 2013) outcomes. This allowed for further exploration of reasons as to the areas in Maths that children like/dislike.

Stage 3

Picture books

After the pictorial questionnaire 'Bear' asked the children to help him to create a class book based on their feelings on Maths using pictures. Each group engaged in one semi-structured discussion session based on the pictures and feelings from each individual's picture. Responses were recorded beside each child's picture. Each child in the group was provided with the opportunity to elaborate or add to another child's picture by sharing their thoughts with 'Bear'.

Observations and reflections of the researchers own field notes were also used as an opportunity to identify themes that emerged from each of the above.

3.6 Choices

The adoption of multiple methods according to Darbyshire et al. (2005) allows for understandings and deeper insights that may not be achieved with a standalone method of data collection. In similar vein Silverman (2010) states that triangulation may strengthen the reliability of an individual method. A triangulation of play-based methods was used for data collection (two qualitative and one quantitative). The choice of the study is therefore mixed-methods. The triangulation of methods will allow for the identification of occurring themes emerging from the three forms of data collection. According to Atkins and Wallace (2012) this 'between-method' can help ensure that the study is trustworthy. The qualitative data that is generated, for example, through circle time can then be used to check against the data obtained from the quantitative method (Bryman 2012) and according to Bryman (2012) this

can provide more powerful data. As children respond in different ways it is therefore important to implement methods that accommodate this difference (Green 2012). The use of multiple play-based methods should therefore accommodate this need while also strengthening the data collected.

3.7 Research tools

The research tools that were adopted in this study are circle-time, a structured pictorial questionnaire and a semi-structured discussion session. Information was generated through a third person, a teddy named 'Bear'. Simon et al. (2008) suggest that 'puppets' are effective methods to initiate conversations and are viewed upon as class mates, therefore minimising the effect of the power differential that exists between teacher and child. Green (2012) suggests that when collecting data on the perspectives of the child, a variety of methodological tools should be considered. This therefore justifies the 'mixed methods' approach adopted by the researcher as children respond differently to different situations. These tools according to Green (2012) should uphold the rights of the child as stated under article 12 of the United Nations Convention for the Rights of the Child. Lundy (2007) provided a model for the facilitation of such rights. 'Circle time' and representation of thoughts through 'images' are strategies that facilitate elements of Lundy's (2007) model, such that children are provided with the 'space' needed to 'voice' their feelings and with an audience that is considerate towards the views of all participants.

The use of semi-structured questioning sessions (circle-time) and semi-structured discussion sessions (class story book) enables the researcher to follow up on answers by encouraging the children to elaborate on responses so as to build more reliable data (Guba and Lincoln 1981).

According to Valla et al. (2000) questionnaires using pictorial format gain the attention and interest of the child. They suggest that using both 'visual' and 'auditory' methods give for better understanding than when using them separately. This therefore justifies the need for the researcher to read aloud the questions during this stage of data collection. The structured layout of the pictorial questionnaire adheres to Hopkins (2008) guidelines in that questions need to be meaningful so as to sustain the interest of the child and to provide important insights as to what children constitute as improving their classroom experience.

3.8 Sample size

Participants of this study comprised of a group of 22 children from first and second class who were taught by the researcher. The children were aged between 6 and 8 years old. Children were placed into three groups following Jenny Mosley's guidelines for circle time. Children were grouped according to their characteristics so as to make the co-construction of data easier and to also support children who were shyer. Table 1 shows the breakdown of children for each group (Appendix 4). Two children (boys n=1 and girls n=1) did not agree to participate in the study. Those children engaged in pre-taught literacy, phonics and art lessons. This comprised of narrative writing with visual aids and writing templates, magnetic letters to build on blends and diagraphs and creating a winter sketch and winter image using a combination of pastels and art materials.

All 22 participants signed and returned the parental consent forms and the child friendly consent forms (Appendix 5 and Appendix 6). All children were given a pseudonym to ensure anonymity.

There were limitations to the selection process. Upon reflection the researcher noted that if the children were allowed to select their own groups this would have promoted the rights of the children. However, this approach was adopted to ensure all children including quieter children got their voice heard.

3.9 Strategy

A theoretical case study approach was adopted in this research. Bryman (2012) suggests that case studies are more suited to both qualitative and quantitative approaches.

The method of data collection entails a 'structured' approach through the use of a pictorial questionnaire but also entails an 'unstructured' element through the use of 'circle time' and 'discussion' sessions based on the class story book. The purpose of this method is to allow for the co-construction of data. According to Bryman (2012) this 'unstructured' approach provides a means for the generation of themes. The questions used in circle time are designed for participants to share openly their feelings and perspectives on the teaching and learning of Mathematics. This less-structured method reflects the openness of the research questions (Bryman 2012).

3.10 Reflexivity

Guillemin and Gillam (2004) emphasise the importance of the researcher providing a critical view of their own role and actions throughout the process of constructing knowledge and acknowledging any previous preconceived notions that may have arisen prior to data collection. This critical view should be conducted in the same manner as all other data collected. Guillemin and Gillam (2004) emphasise that reflexivity is a continuous process that is embedded in every phase of the research. They inform us that our own beliefs and values affect all aspects of our research, that of our chosen methods, research questions, the theory that informs our research, who we include in our research and how we analyse and interpret our findings. This research therefore involved a critical analysis of the knowledge produced and how it was generated.

This study is of importance to the researcher as it enables the researcher to not only identify 'facts' in the construction of knowledge but also provides a means for the researcher to question how these facts were generated which in turn should help inform future practice. In generating such facts, the researcher was aware of the 'power differential' and therefore helped minimise this through the adoption of a third person, 'Bear'. As the researcher is the educator of the participants of this study this process of reflexivity promotes a questioning of the researchers own beliefs in relation to aspects of learning that may or may not be deemed effective. For example, what is believed as important for the researcher in terms of conducting Mathematics in a more structured manner may or may not be viewed as enjoyable for the children. The researcher was aware of her own biases in terms of teaching Maths. This belief included a structured approach to lessons whereby games are used to introduce a topic or as a finishing point so as to reinforce lesson content. Adopting a more unstructured approach would therefore lead to the adoption of more play-based methods of teaching. The researcher is aware that a more structured approach to Mathematics is needed in preparation for formative and summative assessments but also acknowledges that children hold different views in terms of enjoyment of Mathematics.

3.11 Validity and reliability

Cohen et al. (2011) state that individual validity guidelines must be adhered to within mixed methods (quantitative/qualitative). Onwuegbuzie and Johnson (2006) suggest that there should be specific validity guidelines for mixed methods. Examples include the extent to which one method can compensate for weaknesses in the other and how far data can be

integrated to obtain quality conclusions. The researchers 'triangulation' of methods will adhere to the above guidelines so as to increase the reliability of results obtained (Cohen et al. 2011).

Cohen et al. (2011) identify principles in which qualitative data must conform to. For example, in this study the researcher conducted the research and reported back the results from the view of the participants and the research was conducted in the participants' natural environment with a focus on processes rather than outcomes. This also adheres to elements of the qualitative validity guidelines identified by Cohen et al. (2011).

To overcome the possibility of one's preconceived ideas as impacting the results of the data the researcher identified common themes that emerged from the triangulation of methods during all three stages (Atkins and Wallace 2012). To help ensure validity and to avoid the problem of readability levels the researcher read the questions from the pictorial questionnaire aloud to the children so as to avoid any misunderstandings. This will also encourage honesty due to anonymity (Cohen et al. 2011). To overcome a lack of coverage in the pictorial questionnaire (closed questions) responses can be further elaborated on during 'discussion' sessions using the class book.

As children are personally involved in the research and responses were secured through the co-construction of data, this according to Agar (1993) provides a level of validity to the data generated. This was represented in the structure of the researcher's questions during circle time whereby no leading questions were used.

The length of questions and wording of questions and statements were piloted in a small scale study so as to identify any potential problems that may have arisen.

3.12 Pilot study

The researcher conducted a pilot study over a period of three days (one stage per day) to ensure reliability and understanding of questions on behalf of the research participants. This was carried out after ethical approval was granted from the ethical committee at Letterkenny Institute of Technology. Children were selected based on grouping characteristics (n=3). Those children and the data generated were not used in the main study. Children engaged in circle time which provided the researcher with an insight into the importance of using the talking stick with the group of more talkative children while also clarifying the researcher's decision to group children according to their characteristics. It was evident from this session

that the researcher would need to encourage the group of quieter children to participate freely when collecting the data. The researcher therefore decided to avoid the use of the talking stick in some instances when collecting data from the group of quieter children so as to encourage free flowing conversation.

The same children (n=3) completed their pictorial questionnaire having it read aloud by the researcher. Children engaged fully without any hesitation when highlighting their responses. The researcher was able to establish that the length of the questionnaire was appropriate for all groups and that all questions were understood by all participants in the pilot study.

The final section of the pilot study provided the children with the opportunity to represent their feelings about Maths in picture format. It was evident that this section of the study would be more advantageous for the group of quieter children.

The children who engaged in the pilot study were asked how they felt when carrying out the various tasks. Their responses were of a positive nature whereby they expressed that they liked the idea of using the talking stick (ruler) as it meant that they all got an equal chance to express their thoughts and feelings. For example, "I like using the ruler cause you get a turn". All three children responded with great enthusiasm when they compiled their representations of Maths stating that it made it easier for them to talk about their likes and dislikes in Maths.

The pilot study therefore provided the researcher with an immediate insight as to which sections of the study would work best for each grouping. An area for improvement included making sure the talking stick was used for the first two groups with minimal use for the third group. It was also highlighted that the pictorial questionnaire would need to be completed as a whole-class session whereby children were working at their normal seating areas rather than in their groupings based on characteristics. This ensured that children stayed focused and kept on task.

3.13 Method of Data Analysis

Maxwell (2005) emphasises the need for careful reading of data so as to generate categories or themes. Maxwell (2005) suggests that this can take the form of different approaches, for example, a thematic approach. Braun and Clarke (2013) refer to this as thematic analysis which is useful for qualitative research. They argue that this method is appropriate to a broad

variety of research studies. Braun and Clarke (2013) identify six stages of thematic analysis which this study will adhere to:

- Become familiar with the data - this will involve listening to the recordings of circle time more than once so as to identify critical observations and reading/re-reading field notes.
- Data coding – labels to identify meanings and understanding of the data collected.
- Searching for and constructing themes from the data.
- Re-examine themes – to describe the connection between themes.
- Describe and name the themes identified – analysis of all the themes and identification of the fundamental nature of each theme.
- Writing stage – merging of data analysis and extracts to tell a story.

The information gained from the researcher's pictorial questionnaire and field notes (one note book containing observations and data collected from all three stages) will be used during the identification of themes. Silverman (2010) highlights the importance of 'expanded' field notes which will also provide an element of validity to the study.

3.14 Transferability, Uses and Limitations

One of the limitations to this study is the small sample size. The researcher is limited to this number due to time constraints in the primary classroom. The researcher is aware of the financial cost of working with larger sample sizes which is not feasible due to the financial constraints of being a student. Due to the scale of this study, and the context within which it is carried out it cannot be claimed that the method adopted is transferable to another institution or that the results will be similar. The outcomes of the study could be used to help inform practice within Mathematics in a primary school setting.

3.15 Ethical considerations – Recruitment and Consent

Silverman (2010) highlights the importance of ethical consideration, for example, voluntary partaking, safeguard of participants, acquiring permission and confidentiality. The well-being of children participating in this research was a core consideration.

Participants of this research are between 6 and 8 years of age and both parental and child consent was obtained (Appendix 5 and Appendix 6). Information sheets and consent forms were sent out to parents and children. The child's right to refuse to participate will be

respected even in the case where the parents consent for the child to participate has been obtained. Conroy and Harcourt (2009) point out that the language used must be within the understanding of the participant. Child friendly information letters were therefore distributed for all children.

Under 'Child Protection Procedures for Primary and Post Primary Schools' issued by the Department of Education and Skills, it is a responsibility of all school personnel to ensure that 'child protection' is a priority and that it is at the centre of all activities.

The researcher therefore revisited the issue of assent throughout the process and at the beginning of every circle time and looked out for signs that children were feeling stressed or uncomfortable.

The researcher is aware of the power differential (Atkins and Wallace 2010) between child and teacher and therefore helped to minimise this through the use of a visual exit strategy (red card). This ensured a safe and comfortable way of exiting the study at any time which also adheres to the British Psychological Society's ethical code (2010). The researcher used a teddy named 'Bear' as a third person so as to help minimise the effect of the power differential (Simon et al. 2008).

Under the 'Code of Professional Conduct for Teachers' (2016), published by the Teaching Council, teachers should respect the 'confidentiality' of information they gain. All field notes, recordings and data collected in this research will be anonymised by providing each child with a pseudonym. The researcher will scrutinise the quotes used within the study to ensure that they do not reveal the identity of any participant. The research site will not be identified.

As described in the Data Protection Act (Amendment 2003) all data collected by researchers must be stored securely. All data generated in hardcopy will be held securely in a locked cabinet and no names or identities will be used. Softcopy data will be stored on a password protected computer. The data will be kept securely for 5 years after the completion of the project by the researcher's supervisor at Letterkenny Institute of Technology (LYIT) when softcopy will be deleted and any hardcopy will be shredded. LYIT ethical guidelines will be adhered to throughout this process.

Ethical consent was applied for under the LYIT ethical guidelines in which consent was granted (Appendix 7).

3.16 Conclusion

The research methodology and research tools were examined in this chapter. The research method used in this study took the form of a multiple case design whereby convenience sampling was used. The research tools adopted involved the use of a triangulation of methods comprising of circle time, a pictorial questionnaire and semi-structured discussions based on a class story book containing representations of Maths. A triangulation of methods was adopted so as to ensure validity of results and to build upon on children's strengths, capacities and interests. Circle time and the semi-structured discussion sessions allow for the provision of expressing feelings in a safe and comfortable environment. The semi-structured discussion session also provides a means for the children to elaborate on their own representations of Maths. A thematic approach to data analysis was adopted to ensure validity of results. This chapter also provides a detailed description of the ethical considerations that were adhered to under the guidelines set out by the institute. Limitations to the study were also recognised and discussed in the methodology chapter.

Chapter Four – Analysis of Results

4.0 Introduction

This chapter presents an analysis of the data drawn from the co-construction of data during circle time, results from the pictorial questionnaire and thoughts and feelings generated from semi-structured discussions using the class picture book containing each child's representation of Mathematics. During and immediately following each stage the researcher recorded reflective field notes so as to allow for the co-construction of data, to confirm interpretations of data and to identify common themes. The researcher also read back the results at the end of stage one and stage three with each group so as to confirm results. Findings will be presented under each research question. Generalisations cannot be made as the results of this study represent the perspectives and experiences of one particular cohort at a specific time. The breakdown as to how the three research questions will be explored is represented in table 2 (Appendix 8).

4.1 Findings relating to question one - Are there particular aspects of Maths that children like?

From the findings, four themes emerged which included; (a) the use of concrete resources when carrying out addition sums, games and practical tasks, (b) group-work when working with mixed abilities, (c) homework activities with the aid of parental support and (d) feedback in terms of words of praise and teacher assistance.

4.1.1 Enjoyment in Maths when working with concrete resources

The results from this research showed a positive correlation between addition, games, practical tasks and the use of concrete resources. Concrete resources were identified as playing an important role in the positive feelings that the children associated with Mathematical learning. This was characterised by words such as 'happy', 'excited' and 'likes' when discussing representations from the class story book that portrayed 'Bear' working with a variety of concrete resources (Appendix 9 and Appendix 10). It was clear that the "Maths table" plays an important role in learning through the use of such resources. For example, "cubes", "coins", "measuring sticks", "lollipop sticks", "charts", "hundred-square" , "games" and "balancing scales" were associated with enjoyment when engaging in

"shop" activities, "measuring" activities, "weighing" activities and "adding and take-away" sums. The majority of children referred to the use of concrete resources as "fun" when engaging in such practical tasks. Christopher, for example, reported that "pretend buying" is "fun cause you get to use the money"

Concrete resources were also associated with the ability to overcome 'difficulty' in Maths whereby it was suggested that 'Bear' "might be able to work it out" by using his "coins", "cubes" and the "hundred square". The children also identified the usefulness of such concrete resources by contributing words such as 'helps', 'makes it easier' and 'try harder'. This was apparent with some children of average and lower ability. For example, one child from group B reported that "using coins makes it easier" "when playing shop" while another child from group B reported that 'Bear' "might try harder" when "using the cubes to help him". Another child from the same group identified the usefulness of cubes in helping to show the amount of "tens" that can be made from a group of "units".

It was evident from the researchers field notes that the children felt that these feelings were compromised by a lack of such resources when carrying out tests that contained a variety of sums. Children of average and lower ability were concerned that 'Bear' "might not be able to do all of his test" without the use of his "cubes", "hundred-square" and "small clock". Avril explained that "it's hard to add money in your head" when doing tests without being able to "see it".

Concrete resources were also associated with "games" when learning in Maths. Children referred to games as, "building", playing with "cubes", "guess the number", "bingo", "counting can", "dice", "cards" and playing "tables games" before and after Mathematical written activities. Comments regarding enjoyment of such activities included, "really like", "so much fun", "makes me happy" and "I wish we could play Maths games all day". The above comments suggest that games stimulate interest and promote enjoyment for all ability levels.

4.1.2 Group work when working with mixed abilities

It was particularly noteworthy among the majority of children of higher and average ability that group work or pair-work was not characterised by an acceptance of others, rather that of their partner's ability to listen to instructions, ability to engage without any messing or an ability to provide help. For example, Catherine reported that "Bear will get to play his games

and sometimes he'll get to do his sums with the other children in his group", while Conal added that 'Bear' "will like when the other children listen to him and to teacher when she is talking". Comments regarding group-work activities demonstrated feelings of a more positive nature for all ability levels in comparison with pair work activities. Group-work was therefore given precedence over pair-work. It was apparent that this form of learning eliminates feelings of worry that was identified with pair-work. Children commented on the ability to "talk" and "help each other" when "measuring", "playing shop", "weighing" and doing "adding sums". Dialogue among peers was a factor that children associated with enjoyment of group-work. References such as "talk to", "ask" and "show" were made by the children when referring to representations of 'Bear' in a group of two or more (Appendix 11). Representations of this nature provided a means for children of higher ability to highlight their leadership qualities by using words such as 'show them', 'tell', 'ask' and 'help them'. This therefore suggests that mixed ability groups of more than two children have a more positive impact on learning and provides children with a means to further explore their individual skill sets. From the researcher's observations and field notes it was evident that children of lower ability enjoyed group activities more than pair-work because they associated various roles within group activities with enjoyment. This was apparent when it was suggested that 'Bear' could "write down answers" and "tell the class" the answer when working in a group. The researcher had observed that when children of lower ability level were discussing this method of learning it was evident that they feel more comfortable when they have the opportunity to listen to children of higher ability. For instance, Aston reported that "Bear will be able to get help if teacher is too busy". The researcher felt that this may be due to group-work eliminating the fear or worry that is associated with not being able to provide help as in pair-work activities.

4.1.3 Homework tasks with the aid of parental support

In relation to homework tasks there were mixed feelings, both positive and negative, as a small minority of children of lower ability expressed negative feelings that demonstrated a lack of interest in such tasks. Ability levels, subtraction sums, concrete resources and parental support appeared to have an impact upon a difference in attitudes and feelings towards homework tasks. However, it is evident from the results of the pictorial questionnaire that the highest level of enjoyment for most children is Maths homework (82%)

(Appendix 12). During the final stage, that of the semi-structured discussion sessions, most children of average and higher ability associated homework with positive feelings, similar to the pictorial questionnaire. For example, "Bear will like doing his homework" and "he will have time to finish the sums". It was identified among higher and average ability levels that homework is perceived as "easy", and provides an opportunity to "practice your sums at home". This result suggests that there is the possibility that children may experience a sense of familiarity when carrying out homework tasks as this is part of their daily routine. This result was not expected given the fact that children respond in a positive way when provided with a homework pass or a night off homework. Children's feelings of positivity appeared to stem from the value that children place on perceived competence, parental support and the amount of time allocated to tasks. Expressions such as "get the sums right", "get help from Mammy" and "Bear will have time to finish them" support the above theory. Children from all groups expressed thoughts and feelings that highlight the importance of teachers in ensuring that children have an element of continuity and familiarity that links the home environment with the school environment. This was most evident when Alice reported that "the homework will be easier for Bear if his sums are the same" while Christopher suggested that "Bear should practice his sums at night to beat his score on Friday". As Maths homework is based on Mental Maths activities that contain a variety of short sums, it is therefore clear that most children of higher and average ability enjoy the challenge of a combination of sums whereby parental support can be provided. It was obvious that children of lower ability felt that the above mentioned feelings are compromised when homework tasks are perceived as "different" from "the sums in class", therefore highlighting the need for continuity for children of lower-ability level.

4.1.4 Positive Feedback and the Learning Environment

It was revealed that the learning environment impacts on the learning experiences of the children. Representations of 'Bear' generated responses from the children that indicated the importance of teacher support, praise and positive comments. Words and comments such as "get help", "ask teacher", and "teacher will tell him how to do it", demonstrated the children's train of thought when thinking about the factors that support their learning experiences. Teacher support was also highlighted when it was suggested that "Bear will like everything if he knows how to do it" and that "teacher can show him if they're tricky".

Acknowledged effort was also identified as promoting positivity. For example, 'Bear' trying 'his best" was associated with the class teacher "not" getting "cross. Acknowledged effort was also apparent when Catherine reported that "if you get your sums wrong teacher knows if you've put in a good effort". This acknowledgement of effort was supported further when Cait referred to teacher getting cross if "he messes" but "she'll be happy if he tries" while Conal reported that "Bear might get some of his sums wrong but if teacher tells him that he did a good job he might be happy". This suggests that positive teacher comments and acknowledgement of effort can change the negative feelings associated with results and getting sums wrong to more positive feelings. Those children were undoubtedly able to articulate the importance of positive feedback.

Engaging activities such as "fun" tasks support the importance of an environment that promotes positive active learning through the use of stimulating resources. This is supported when some of the children referred to aspects of the learning environment that support their learning. This was apparent when Belinda suggested that "we can check the money chart to see what coins we need" when "playing shop", while Cara added that the "number chart and games on the Maths table will help Bear". Additional resources from the environment were also highlighted as a support to learning. This included, "words on the wall", "pictures and names of shapes", and the "Maths table for early finishers". Aspects of the immediate learning environment therefore play a significant role in the learning experiences of the children. The outdoor environment was also a contributing factor to "fun" tasks for all children. For example, it was reported that "It's really fun doing our work outside". The association of "fun" with outdoor tasks was common to all groups. It was apparent that the children felt that this form of learning is more enjoyable than classroom-based tasks. For example, it was reported that "Sometimes we find things in the hallway for Maths...it's much more fun than in the class". These comments suggest that active learning promotes positivity for all ability levels.

4.2 Findings relating to question two: Are there particular aspects of Maths that children dislike?

The three themes that emerged from this study in relation to areas that children associated with a dislike towards Mathematics included (a) pair-work when working in a mixed ability setting, (b) end of term tests (containing a variety of sums) and (c) problem solving activities.

4.2.1 Pair-work when working in a mixed ability setting

The researcher noted that there were mixed views on the perceptions of pair-work. Pair-work or working with a partner was positively associated with aiding Mathematical learning during the initial stage of data collection. However, throughout stage three children of lower, average and higher ability levels all highlighted different reasons for worry when working with just a partner (Appendix 13). The results of the pictorial questionnaire (dislikes n=3, likes n=9, unsure n=10) suggests that there are mixed feelings in relation to this form of learning. The researcher had observed that children of higher ability level expressed feelings of uncertainty, children of average ability expressed both positive and negative feelings and children of lower ability expressed mainly feelings of a negative nature. This was mainly associated with the ability to contribute during pair-work.

For example, during stage one Aston commented on pair-work by suggesting that 'Bear' "Might like it sometimes because his partner might not know some of the answers" and Adam felt that "Bear will probably like his partner if he helps him". This suggests that some children feel that they themselves do not benefit from pair-work activities if they feel that their partner lacks the ability to provide assistance or lacks engagement during pair-work activities. Other areas of concern included a partner that "might not listen" while another child reported that a partner "might mess". Some children of lower ability were not as eager to comment on the helpfulness of pair-work rather referring to the preferred option of getting "help from teacher" or working with a "friend" during Maths activities. Other examples included; 'Bear' "won't like working with someone better", that the "other person won't help Bear', and that 'Bear might get worried'.

Pair-work was however identified as a helpful method of learning among a small minority of children of lower ability as they felt they could "get help" from their partner. Other variables associated with pair-work among all abilities included enjoyment when paired with a friend and an eagerness to work with a kind partner. For example, "I like doing Maths when I get to stay with my friend" and "Bear will sometimes get to do his Maths with someone who will be nice to him and show him things if they're tricky". This was most evident among children in group C (shy). These results suggest that working with a partner (mixed abilities) can lead to frustration and disengagement for children of both higher and lower abilities.

4.2.2 End of term tests (variety of sums)

The association of tests containing a variety of sums, with feelings of worry and angst calls to question the impact of such forms of assessment. The results from this study indicate a

preference of weekly tests (formative assessment) over end of term tests (summative) for children of lower and average ability, with mixed feelings expressed for children of higher ability. Friday tests (formative) were identified as an area that most children of all ability levels associate with their weekly routine. This was evident when children commented on and engaged positively when talking about representations of 'Bear' carrying out a "Friday test" (Appendix 14). Feelings expressed in relation to such representations included, "Bear looks happy" and "Bear wants to beat his score". A sense of familiarity during Friday tests was also evident when Clodagh informed the group that 'Bear' "knows which table test it is". It was evident from the responses given that end-of-term tests (summative) impact negatively on some children's attitudes and feelings. Concern was expressed with comments regarding "too many sums" and that "some might be hard" without the use of "cubes", "coins", "clocks" and "number fans". The researcher had observed that children of higher ability commented on the difficulty of "some" sums rather than the absence of concrete resources in aiding the process. Children of average and lower ability commented on the absence of concrete resources along with not being able to "ask for help" during a test. One child expressed concern for 'Bear' by indicating that he might have a "funny feeling in his stomach" before a "big test".

The researcher had observed that there was a link between end of term tests, concrete resources and subtraction. It is also worth noting that end of term tests (dislikes n=7, likes n=10, unsure n=5) and subtraction (dislikes n=5, likes n=9, unsure n=8) were placed in the top five areas of concern from the results of the pictorial questionnaire. The researcher observed that this could be a contributing factor towards the negative feelings associated with end of term tests or standardised tests. Subtraction was initially referred to as "sometimes tricky", while the third method of data collection concluded that subtraction was being perceived as "very tricky" among children of lower and average ability. Children associated subtraction with calculating "change", finding "the difference" and when showing an "earlier" time on the clock. For example, it was reported that "it's hard to count change" and "counting back the time is hard".

Children of lower and average ability made reference to a lack of concrete resources during tests. Carrying out tests with "lots of different sums" without the use of "cubes", "hundred square", "lollipop sticks", "small clock" and "coins" appears to be a significant obstacle that that some children recall as impacting their ability to effectively complete tests. The results

of this study therefore identify the need for constructive alignment with lesson content and methods of assessment.

4.2.3 Problem solving

Problem solving was an apparent association with mainly negative feelings among children of lower and average ability. Children of higher ability contributed mixed feelings towards problem solving tasks. This was evident in the final stage of data collection.

Children associated some of the representations of 'Bear' from the class story book with the possibility of 'Bear' having to "read sentences" from his Maths book (Appendix 15). Expressions included 'Bear' "might not know all the words", 'Bear' "might think it's hard" and 'Bear' might not know if it is an "adding or take-away sum". These results also emphasise the importance of providing opportunities for the children to visualise the data (Jonassen 2003) whereby one child referred to the importance of using cubes to "show" the sum. Brónagh discussed the importance of showing 'Bear' "pictures of the apples and bananas or ice-creams" and drawing "the apples and bananas" on the "whiteboards". However, the researcher noted that some children of lower and average ability were demonstrating signs of doubt in their own abilities when discussing this area of Maths. One child reported that 'Bear' "won't be able to do them". Upon further analysis it was reported that 'Bear' "might always get them wrong" because "they're boring". Echoed in this theme is the association of performance with ability (Povey 2010) and the importance of the provision of achievable tasks. This was noticeable when it was reported that the "words are hard" resulting in Maths being perceived as "boring". These statements demonstrate that this process adds an element of difficulty and impacts on enjoyment levels for most children of average and lower ability. However, the results revealed conflicting outlooks about word problems. Some children seek a challenge and feel that this form of learning creates a diversion from traditional routines whereby opportunities are provided for learning new concepts through active learning whereas some children feel that easier tasks provide for more enjoyment. This was evident when Barlow described this form of learning as "fun" when getting to "move around tables", whereby Bernard referred to the possibility of carrying out "different sums" as "more fun". It would also appear that children of lower and average ability find themselves getting distracted when engaging in such tasks that are deemed "boring" and "no fun". This was apparent from comments that the children associated with

problem solving tasks. For example, "teacher might get cross with Bear" as "Bear might not be listening".

It was also worth noting that some children of higher ability expressed more positive feelings that highlighted the importance of ensuring that lesson content provides a mixture of challenging tasks. Expressions included "try it himself", "ask teacher for help reading it" and "use the cubes to show it". This reinforces the importance of motivating the learner as it is evident that a small minority of children of higher ability enjoy the challenge of trying to work out a problem and find the answer without the help of the class teacher.

4.3 Findings relating to question three: What are children's lived experiences of Maths?

Findings from data collection in relation to the children's lived experiences of Maths were categorised under the following four themes: (a) the provision of choice and rights of the child, (b) classroom practices involving collaborative learning, (c) play-based learning activities and (d) feelings of worry associated with assessment in the classroom.

4.3.1 The Provision of Choice and the Rights of the child

Concrete resources take precedence when learning in Maths for this group of first and second class children. The use of such resources was a consistent feature in their learning experiences. Children commented on their experience of using such resources on a daily basis, for example, during practical tasks, group-based tasks, pair-work tasks and when working individually on written sums. Children talked about their experiences of getting to work with "cubes", "lollipop sticks", "clocks", "money", the "hundred square", "balancing scales" "whiteboards" "metre stick" and "games" when "adding", "subtracting", "measuring", "playing games" learning the "time" and when doing "money sums". Children spoke of their ability to choose or "pick" the resources from the "Maths table" so as to "help" or support their learning. This was apparent when Conal reported that "If I get stuck I get the money at the Maths table" and "When we do money I get a hundred-square and a number line to do my adding". This was further supported when Christopher added that "Sometimes I need to go and get the cubes to help me do my tens and units". The children are therefore free to choose what they feel supports their learning therefore having an element of input into their lessons. This in turn promotes the rights of the child as outlined under 'The New Sociology of Childhood' (Matthews 2007). The importance of listening to the child's 'voice' was also echoed in this theme. This was brought to light when Andrea reported that

"Teacher, in Maths you always ask us and we tell you if we're stuck". This suggests that the children feel that they are listened to and that they are able to inform the teacher as to when they are ready to move on within a given topic. However, such experiences may be compromised at times when comments regarding the need to ask a "partner" or a "friend" for help during group-work or pair-work tasks were made.

4.3.2 Classroom practices

Individual learning and collaborative learning (pair-work and group-work) were associated with the children's day-to-day learning experiences in Mathematics. This was apparent when Barry stated that "We work in groups and sometimes we work with our partner". Practical tasks were also identified as common practice when learning 'money', 'time', 'weight', 'fractions' and when 'measuring'. Children referred to their experiences of being able to "play shop", "measure things", "weigh food" and "show halves and quarters" alongside other children. 'Real objects' also featured in children's experiences when carrying out practical tasks or hands-on tasks. This was recognised when Bernie reported that "I loved when teacher brought us in chocolate when we were doing a half", while Bernard mentioned "folding paper" as important when doing "fractions". This reinforces the importance of providing a hands-on approach for children to understand Mathematical concepts which is achieved by providing access to a variety of resources through individual, pair-work or group-work tasks (DES 1999).

Daily classroom routines that were experienced by the children such as "book" work, "copy" work, "games" and "playing" activities were not just limited to the immediate learning environment but were also linked to the outside environment. The "outside" environment was therefore identified as a contributor to the learning experiences of the children. 'Maths trails' were mentioned in the form of "getting to find things on the yard". Recalled experiences included "finding things" that are "different shapes" and using a "tally chart" to count the "mini-beasts". Enjoyment of such experiences was stressed by Cara who reported that this was "so much fun". This reinforces the importance of providing children with a variety of learning experiences so as to generate enjoyment in lessons (DES 1999).

4.3.3 Play-based learning

Maths experiences were also associated with "games" before and after lessons. It is apparent that children experience 'structure' in their lessons based on their responses. Comments included, "We get to play with the cubes before we do the page in the book", "We play our tables game at the end" and "I like playing bingo and guess my number before we start". It was also apparent that games provide an element of continuity for the children whereby children experience a topic first hand through the use of a game. Bernie reported that "We start Maths with a wee game and then teacher shows us how to do our sums in our circle time. We can go up and use the whiteboard too if we don't know. Then we do a page of sums". This suggests that the children associate learning new concepts with 'games' initially. Experiencing learning through play was associated with games such as "snakes and ladders", "loop games", "counting can", "Maths dual" and using the "whiteboard" to do "fun Maths". There was also an association of Maths 'games' with 'Maths trails'. Aaron commented on being able to "...do Maths outside sometimes which is really fun". Words and phrases that were associated with this form of learning included, "like", "really like" and "love playing" which support the need for activities that promote enjoyment in Maths.

4.3.4 Assessment

Children referred to their experiences of both formative and summative assessments in the form of "Friday tests", "tests with a lot of different sums" and self-assessment. For example, comments included, "We do tests on Fridays", "We do our table tests" and "We sometimes do important tests with lots of sums". Some children experience as sense of worry, which is more apparent with end of term or formal assessments. This was evident when children talked about their experience of Maths tests. For instance, "We do tests but sometimes we don't get to use the things on the Maths table to help us", "We don't ask for help cause it's a test" and 'Bear' might have a "funny feeling" before a "big test".

Echoed in this theme were methods of self-assessment which were mentioned in the form of "traffic lights", "thumbs-up, thumbs-down" and "happy and sad faces". One child reported that "We can show teacher our faces if we don't know how to do things". Other comments included "I like using the faces" because "teacher will know" if the sums "are tricky". It was brought to light that self-assessment and informal assessments on a daily basis can help reduce the negativity or worry that some children experience when getting sums wrong or when experiencing difficulty

4.4 Summary

The research revealed key findings that highlight areas of enjoyment in Maths along with areas that constitute a dislike in attitudes towards Mathematical learning. Results in relation to the lived experiences of children in a first and second class Mathematical environment were also discussed in this chapter.

Key findings included enjoyment of Maths when working with concrete resources and engaging in play-based learning. Group learning that promotes practical tasks with mixed ability levels also impacted positively on learning. Teacher comments and teacher praise along with homework activities that promoted continuity were viewed upon as impacting positively on Mathematical enjoyment. In contrast to this, key findings in relation to negative feelings associated with learning in Maths included pair-work tasks of mixed ability levels, end of term tests and problem solving tasks.

Finally, it was identified that children's lived experiences in Maths range from engagement of tasks during play-based learning, engagement in tasks during individual and collaborative learning, along with the use of self-assessment techniques and the ability to choose materials or resources that effectively promote and enhance the learning experience of the child.

Chapter 5 – Discussion of findings

The purpose of this study was to explore the perspectives and lived experiences of children in Maths, revealing a number of key themes which are significant in these children's feelings and motivation towards Mathematics. While these results are explicit to a particular group of children, they could inform practice during the succession from junior to senior years of school. The circle-time procedure and semi-structured discussion sessions were helpful for enabling children to elaborate and contribute their thoughts in a comfortable way.

Congruent with Fyfe et al.'s (2014) findings, a critical aspect for all groups was the association of Maths with the use of concrete resources. These results are consistent with research carried out by Burns and Hamm (2011) whereby children performed better when using concrete resources over the use of computer based tasks. This also calls to question the idea of phasing out concrete resources over time (Fyfe et al. 2014). The results of this study however showed a correlation between concrete resources and play, whereby a small minority of children of lower ability level commented on the enjoyment of building with cubes rather than commenting on their usefulness. This highlights what appears to be a concern or a distraction for Mathematical learning (Petersen and McNeil 2013, McNeil et al 2009). As concrete resources are fundamental in building a solid foundation (Fyfe et al. 2014) it would therefore be more beneficial to incorporate the use of plain resources over rich resources as identified by Petersen and McNeil (2013).

The results of this study further highlight the importance of communication among children whereby dialogue is at the core of collaborative learning. The results revealed that group-work is given priority over pair-work and individual tasks. This is consistent with Dunphy's (2009) research in that there should be a move towards group tasks that promote investigations and eliminates individual learning. However, it could be argued that collaborative learning may act as a distraction for some of the children who showed a preference of working with a 'friend' during such tasks. This may result in withdrawal from tasks as identified by Kutnick et al. (2007) when children feel their needs are not being provided for. This current study associates ability level as either impacting positively or negatively on collaborative learning. For example, worry in terms of the ability to contribute during pair-work activities was identified as a factor that impedes learning as opposed to group-based tasks being associated with the potential to overcome this problem. It was

identified that all ability levels felt that their needs were accommodated for with group-based learning. In comparison to this, Galton et al. (2009) and Kutnick et al. (2007) associate group learning with the potential of some children 'messing' therefore impacting negatively on group-based tasks. This is consistent with Hufferd-Ackles et al.'s (2004) findings in that there is the possibility that children may make incorrect choices as it is recognised that managing time may pose as a challenge for educators when engaging in collaborative learning (Galton et al. 2009). This was apparent from the results of the current study whereby children commented on the possibility of getting help from a "partner" as the class teacher was being perceived as "too busy". This highlights the issue of 'time management' of group based tasks.

As revealed in the literature, engaging children in problem solving is an area of difficulty for teachers (Geist 2015). The results of this study draw attention to the challenge of teaching problem solving when children from a young age have already developed a negative belief in their own ability. For example, 'Bear' "won't be able to do them" was a comment made that signifies doubt in ability therefore suggesting that motivational levels are low (Povey 2010). These results are consistent with Vilenius-Tuohimaa et al.'s (2008) research in that technical reading fluency impacts problem solving abilities whereby it was reported that "Bear mightn't know all the words". Although problem solving tasks were associated with negative feelings among lower and average abilities, children of higher ability enjoyed the challenge of word problems. Support in the form of "cubes" and "pictures" were indicators that visual cues provide for better understanding of word problems (Csíkos et al. 2012). It is also worth noting that current instructional classroom practices for problem solving may be a factor that needs to be addressed. References associated with this form of learning included "boring" and "tricky". As identified by Fuchs et al. (2009) structured schema that facilitates all abilities is a necessity for motivational purposes along with the incorporation of ICT as according to Bragg (2007) this stimulates interest and curiosity.

Children's semi-structured discussions and the researcher's observations suggest that parental involvement contributed to the mixed views that were held in relation to homework tasks. Expressions such as "Bear" "might forget to do his homework" and "Bear sometimes mightn't know how to do his homework", suggests that for a small minority of children homework is not given the attention that is needed. According to Singh et al. (2002) the importance of parental involvement is fundamental especially among young children as this impacts attitudes held and belief in achievement. However, Melhuish et al. (2008) suggest

that there are factors in the home environment that can be difficult for the class teacher to monitor or control, for example, the level of engagement with learning activities, if any. One of the challenges facing teachers of younger children is supporting children experiencing difficulty, in particular where the home environment impacts the level of effort and a child's belief in their own ability (Chang 2012).

Teacher comments and feedback regarding tests and classroom tasks may be a challenge for some children to view in a positive or constructive manner. This was brought to light when children commented on feelings of being "happy" when feedback is positive and when support is provided in the form of "help" and "show". This concurs with Hackenberg's (2005) research in that Mathematical care is a priority but can however pose as a challenge for teachers when providing feedback in terms of comments that are of a constructive nature. The children's association of 'self-assessment' practices with positive feelings supports Hackenberg's (2005) belief in the importance of co-operative relationships between teacher and child through frequent reflections and constructive feedback on performance. The results also indicate that 'self-assessment' methods allow for the provision of dialogue between teacher and child so as to enable children to feel comfortable to voice their concerns in terms of areas of difficulty (Sommer et al. 2013). Formative assessment measures allow for continuous communication between educator and child, thereby reducing the negativity associated with an overall result from summative assessment measures. This in turn should help build resilience (Phelan et al. 2011).

Difficulty associated with the ability of educators in predicting anxiety levels when doing tests has been acknowledged by Urhahne et al. (2011). Larkin and Jorgensen's (2016) study found that Maths anxiety results in negative attitudes towards Maths, but failed to show why children are anxious in Maths. Hopkins (2008) highlights that there may not be enough consideration given to children's views in terms of effective classroom conditions that promote enjoyment. This current study aims to provide an insight into the various factors that children associate with enjoyment or lack of enjoyment in Maths.

Unlike the evaluation of studies offered at the start of this research, the findings of the present study are sited within a small context.

Chapter 6 – Conclusions and Recommendations

6.0 Conclusions and Recommendations

In this study words such as "helps", "happy", "love playing" and "likes" were key indicators that the children reflected positively on various areas in Maths. Words such as "boring", "no fun", and "hard" were indicators that children also reflect negatively on aspects of Maths. Current literature lacks research in the area of Maths anxiety in children along with reasons for such anxiety (Jameson 2014). A large extent of research on Maths anxiety has been based on adolescents and adults (Jameson 2014). Research advocated to children's views of effective learning environments is also limited (Buckley 2013). This current study adopts a 'multiple methods' approach so as to provide a deeper insight into children's views and experiences rather than a stand-alone method (Darbyshire et al. 2005). The different approaches complement each other by enabling the children to express various aspects of their experiences. Such methods demonstrate that we as educators view and recognise children as active agents in their own learning whereby they have an element of control in terms of how they contribute (Darbyshire et al. 2005).

Social interaction has been recognised under 'The New Sociology of Childhood' as fundamental in the active participation of children creating their 'social situations' (Danby and Farrell 2004). So far there have been a small number of studies that have gained the views of children in relation to what children deem as important in the classroom. The results of this study exemplify the 'social nature' of learning, in terms of working in collaboration (group-work) with other children (mixed abilities) while also engaging with and receiving encouragement in the form of praise from the teacher. Such support and praise are viewed as building upon intrinsic motivation, therefore resulting in increased levels of engagement (Anuola et al. 2006).

Even though children referred to the role of the teacher and peers in providing support, it was concrete resources that emerged as playing the most significant role in aiding learning. The use of such resources were identified as important contributors to expressions expressed in terms of effort, belief in achievement and attitudes held by the children towards Maths activities.

Providing the child with a voice offers educators the opportunity to listen to children's views of their own experiences while enabling children to play an active role in constructing their

learning experiences (Danby and Farrell 2004). By studying children's experiences we possibly can determine what does and does not work, while finding ways to improve the welfare and interests of the child. It is hoped that this research will provide the information that is needed to support curriculum design and to modify the learning environment whereby children feel free and comfortable both now and in the future in expressing their concerns/likes/dislikes and other factors that they associate with Maths and other subjects.

6.1 Limitations

There were however limitations to this study. Due to time constraints and the sample size of this current study the results cannot be generalised. The results represent a small number of children from one school. It is also important to note that it takes time to obtain the views of young children. The method used depended on an interpretive approach whereby the researcher decided what to include from the field notes. There are elements of the researcher's interpretations which could be construed differently by others. The researcher helped to limit any bias through the use of a triangulation of methods. The researcher feels that the engagement of children in discussions during Maths lessons would add a further dimension to the study.

6.2 Implications for Policy and Practice

The results of this current study provide a basis for a review of current numeracy and homework policies. The results highlight challenges in the form of time that is spent on the teaching of problem solving and resources that need to be implemented to support this. A whole school approach would need to be adopted to facilitate this process. Liaison with the home environment is needed to inform and ensure that parents are provided with the necessary information that may be needed to help build strong Mathematical foundations. For example, the provision of information packs that inform parents of strategies that are used in class to work through problems. There is a need for a focus on a whole school approach to the development of problem solving skills and the need to support this by investing in ICT resources (i-Pads) so as to increase engagement and enjoyment of problem solving tasks.

The results also highlight the need for additional classroom support whereby group-based tasks could take a more prominent role. This would call for a change in the Special

Educational policy, whereby learning support hours could be allocated to more in-class support, thereby facilitating the provision of team teaching.

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Appendices

Appendix 1 - The story of Bear

Bear was a new addition to first and second class (signifying the start of data collection). He informed the children that he was going to be a new addition to their class for a period of 3 weeks (child friendly information sheet). He also informed the children that after the final week he would be leaving to go back to his old school having learned some new things about Maths (thank you card signifying the end of data collection). Bear told the children that he wanted to hear all about the different ways that the children learned in Maths. He told the children that he would like them to tell him how they think Bear might feel when learning about the time, doing addition and subtraction sums, learning his tables, using concrete resources, working with a partner and to also tell him about the things that might help him and how he might feel when doing class tests or answering questions for his teacher. He told them that they could tell him this in small groups during circle time. Bear also explained to the children that he would like them to show how they feel by colouring in a happy, sad or an unsure face when answering some questions about Maths for Bear (pictorial questionnaire).

Bear then informed the children that in the final week they would be asked if they would like to draw a picture about any aspect of Maths and to use words or sentences to describe what is happening in the picture and how they might be feeling. Bear explained that all of their pictures would be put together to make a story book about Maths and that everyone would get the opportunity during circle time to talk about their picture.

Appendix 2 - Questions and statements used during circle time

Circle time

The following questions and statements were used during circle time:

-Would everyone like to tell Bear something about Maths?

-Would everyone like to tell Bear what we do in Maths?

-I wonder is there anything in Maths that Bear will find hard.

-I wonder is there anything in Maths that Bear will find easy.

-I wonder is there anything that will help Bear when doing his sums.

-I wonder how Bear will feel when working on his own, with a partner or in a group.

Appendix 3 - Pictorial Questionnaire

	Dislike	Likes	Don't know
	 Dislike	 Likes	 Don't know
How does Bear feel when he is doing Maths homework?			
How does Bear feel when he is doing subtraction sums?			
How does Bear feel when he is doing addition sums?			
How does Bear feel when he is doing the time?			
How does Bear feel when doing money sums?			
How does Bear feel when doing his Friday table test?			
How does Bear feel when doing a test with a lot of different sums on the page?			
How does Bear feel when he is playing his tables game?			
How does Bear feel when working with his partner during Maths time?			

How does Bear feel when working on his own during Maths time?	
How does Bear feel when he sees all the sums on his Maths page?	

Appendix 4 - **Table1: Number of children in each group**

Participants	**Boys - 1st Class**	**Boys 2nd Class**	**Girls- 1st Class**	**Girls - 2nd Class**	**Total number**
Group A (talkative)	N= 3	N=1	N =3	N=1	N=8
Group B (observant)	N=3	N=1	N=2	N=1	N=7
Group C (shy)	N= 3	N=0	N=3	N=1	N=7

Appendix 5 - Child information sheet and consent form

Dear first and second class, My name is Bear.

I will be coming to your class for a visit. I want to learn all about Maths and the things that you do in Maths.

Would you like to tell me all about Maths during circle time?

I will make a story book with all of your pictures about Maths. Would you like to make a story book with me about Maths and tell me about your drawings?

Would you like to answer some questions to help me find out about all the things you like or don't like about Maths by colouring a happy or sad face?

Remember...if you get too tired when talking and want to stop, that is okay. Bear understands that we can get tired sometimes☺.

Thank you all for reading my letter.
See you all very soon.

Bear

Consent form for children

Name: _____

Please colour the box

Yes I would like to help Bear ☐

No I do not want to help Bear ☐

Appendix 6 - Parental information sheet and consent form

Information Sheet

Date:

Title of project: An exploratory study into children's views and lived experiences of Mathematics in a Primary School in Co. Donegal.

Dear Parent/Guardian,

I Frances Gallinagh wish to undertake a research project in first and second class and I am therefore inviting your child to take part in the above research project. I am a student of the Masters in Arts in Teaching and Learning programme at the school of Business at Letterkenny Institute of Technology, Letterkenny, Co. Donegal.

My research: An exploratory study into children's views and lived experiences of Mathematics in a Primary School in Co. Donegal.

Aim: To gather information on the experiences of children in Mathematics over a period of 3 weeks.
This will involve:
-Circle Time
-Storytelling – picture book
-Pictorial questionnaire

Purpose: There is little known about the everyday experiences of children in primary school in relation to Maths and what their perceptions are of the educational provision provided. This is an exploratory study seeking to address this gap and open further research avenues to an area still in its infancy.

Confidentiality: All data generated in hardcopy will be held securely in a locked cabinet and no names or identities will be used. The data will be kept securely for 5 years after the completion of the project by my supervisor at Letterkenny Institute of Technology. Softcopy will then be deleted. Any hardcopy will be shredded after 5 years. In relation to the pictorial questionnaire, it will be anonymised.

I would be grateful if you would read your child's information sheet to him/her so that he/she understands the information before providing consent.

If you are satisfied with the information provided, and willing to participate, please tick the boxes on the consent form attached, sign it, and return it to me.

Participation in the research is entirely voluntary and your child's involvement will only be allowed with your agreement, and the agreement of your child. If you do not wish for your child to take part in the study or if you change your mind, this will not impact in any way on your child's learning. If you do not wish for your child to take part he/she will carry out assigned activities during the time allocated towards this project.

If your child withdraws from the study following data collection then all information will be deleted and will not be used in this research. The information provided by your child will be used in my dissertation for Masters in Learning and Teaching. I may also use the information to present the findings at conferences or for publication in academic journals.

You can contact me by email at XXXX or by phone at _____Primary School, Co Donegal. My supervisor contact details are Dr. Karen Patton, The School of Business, Letterkenny Institute of Technology, Letterkenny, Co Donegal, 074 91 86376, and email at karenpatton@lyit.ie.

Thank you for taking time to consider participating.

With Thanks,

Yours Faithfully

_____
Frances Gallinagh

Consent Form

Title of project: The Lived Experiences and Perspectives of the child of Mathematics in the Primary School

Name of researcher: Frances Gallinagh

If you are in agreement with the statements below, please tick the boxes.

- I have read the attached information sheet which explains the research project named above. Yes ☐
- I understand that the letter is asking for my child to participate in circle time, storytelling and a pictorial questionnaire. Yes ☐
- I understand that all the information gathered will be kept strictly confidential and that my name and my child's name will not be included in any reports. Yes ☐
- I understand that participation is voluntary and that I can withdraw my child at any stage. Yes ☐

Also, please tick one of the following boxes to indicate whether or not you agree to taking part:

☐ I **AGREE** to my child taking part in the above research

☐ I **DO NOT AGREE** to my child taking part in the above research

Signature: _____ Date:_____

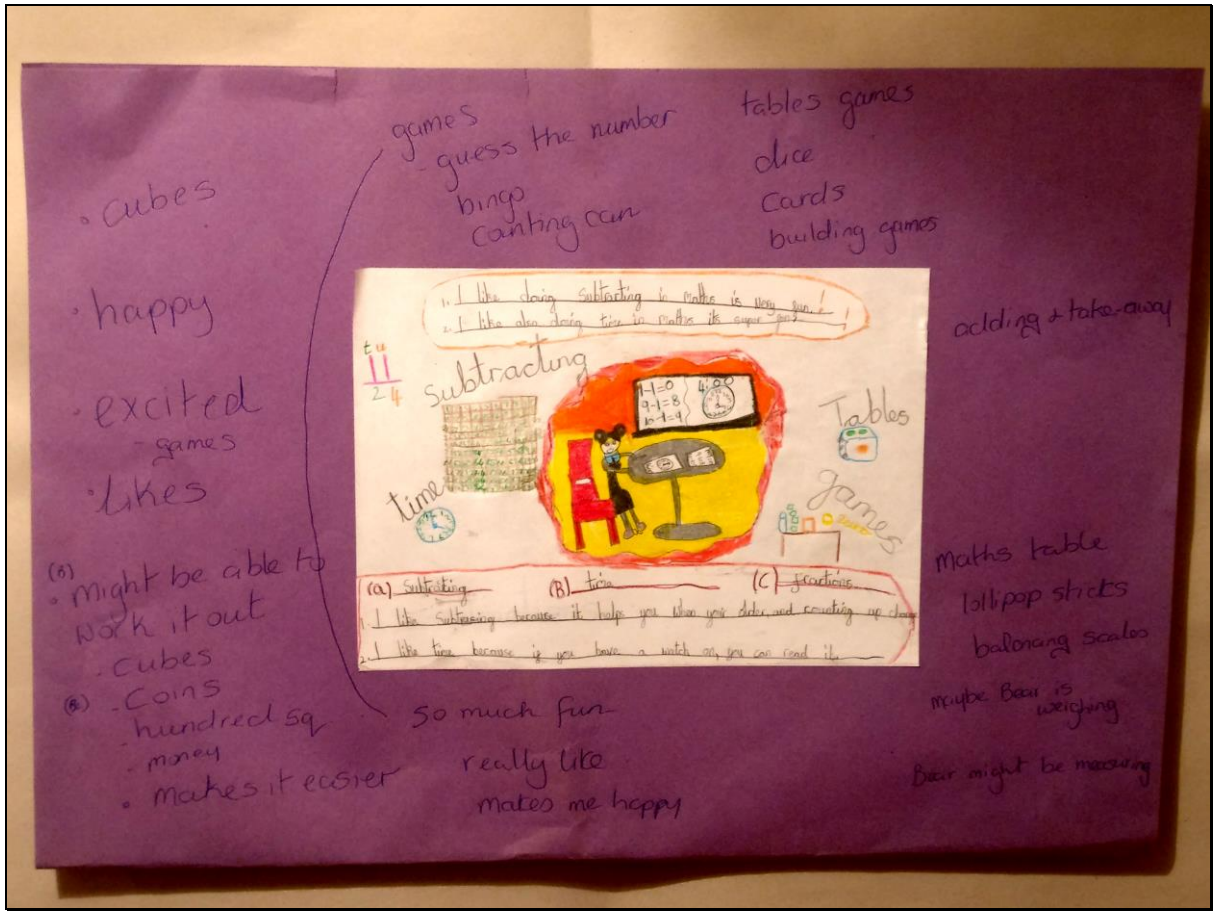
Name:_____

Appendix 7 - LYIT Application Form for Ethical Approval

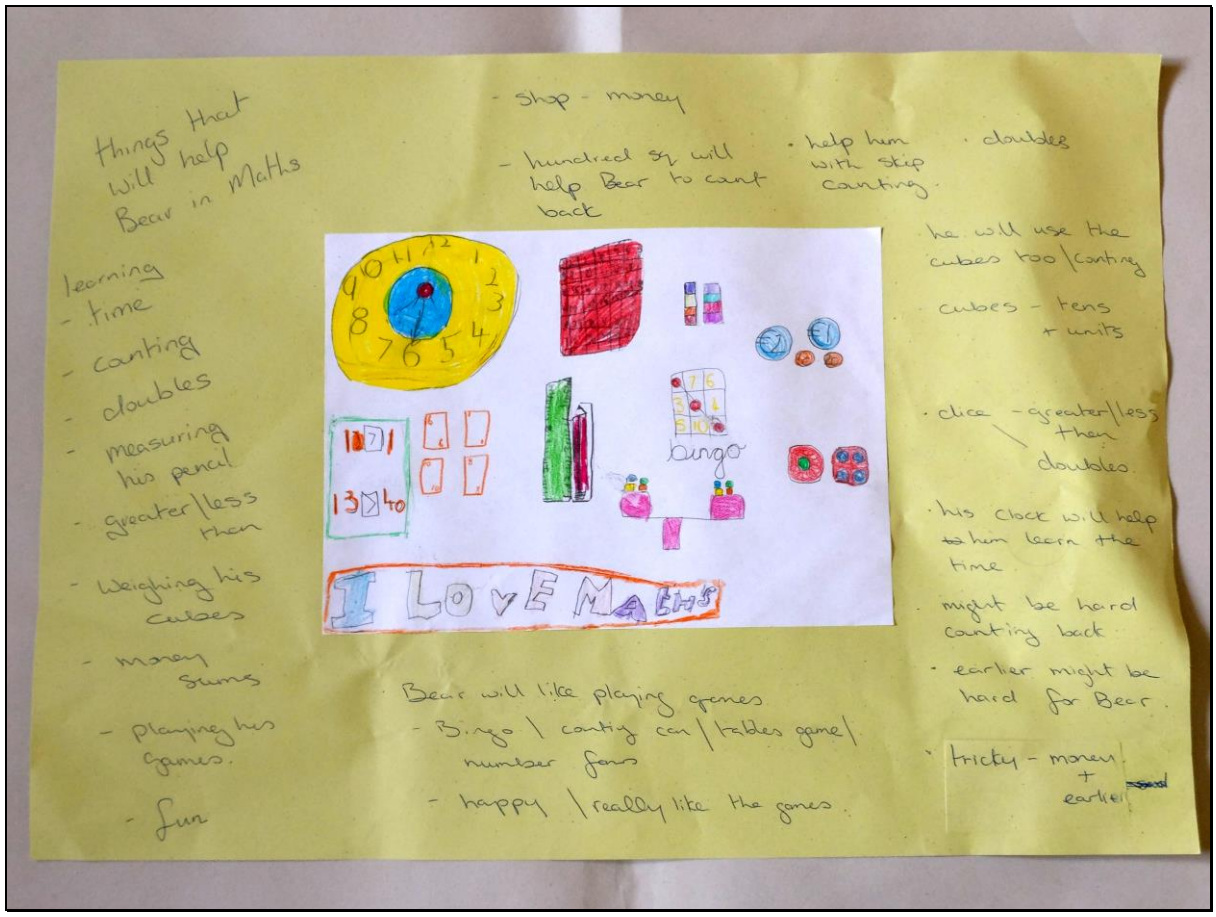
Appendix 8 - Table 2: Breakdown of Research Questions

<table>
<tr><th colspan="3">Research questions:</th></tr>
<tr><td>Q1. Are there particular aspects of Maths that children like?</td><td>Q2. Are there particular aspects of Maths that children dislike?</td><td>Q3. What are children's lived experiences of Maths?</td></tr>
<tr><td colspan="3">The three research questions will be explored through a triangulation of methods:
a) Circle time
b) Pictorial questionnaire  c) Semi-structured discussion sessions based on representations of Maths</td></tr>
<tr><td>Circle time
The following questions and statements will be used during circle time:
-Would everyone like to tell Bear something about Maths?
-Would everyone like to tell Bear what we do in Maths?
-I wonder is there anything in Maths that Bear will find hard.
-I wonder is there anything in Maths that Bear will find easy.
-I wonder is there anything that will help Bear when doing his sums.
-I wonder how Bear will feel when working on his own, with a partner or in a group.</td><td>Pictorial Questionnaire
Children will indicate their feelings towards 11 areas in Maths:
-Maths homework
-Subtraction sums
- Addition sums
-Learning the time
-Money sums
-Friday table test
-End of term tests
-Use of concrete resources
-Working with a partner
-Working individually
-Seeing a lot of sums on a page</td><td>Semi-structured discussion sessions
-Children will draw their own representations of Maths
-Children will discuss their representations in their groups
-The researcher will record this on each child's representation</td></tr>
<tr><td colspan="3">Thematic analysis of data involving the following stages (Braun and Clarke 2013):
Listen to recordings of circle time more than once and reading/re-reading field notes
Data coding – labels to identify meanings and understanding of data collected
Construct themes from the data
Re-examine themes to describe the connection between themes
Describe and name the themes identified – identification of the nature of each theme
Merging of data analysis</td></tr>
</table>

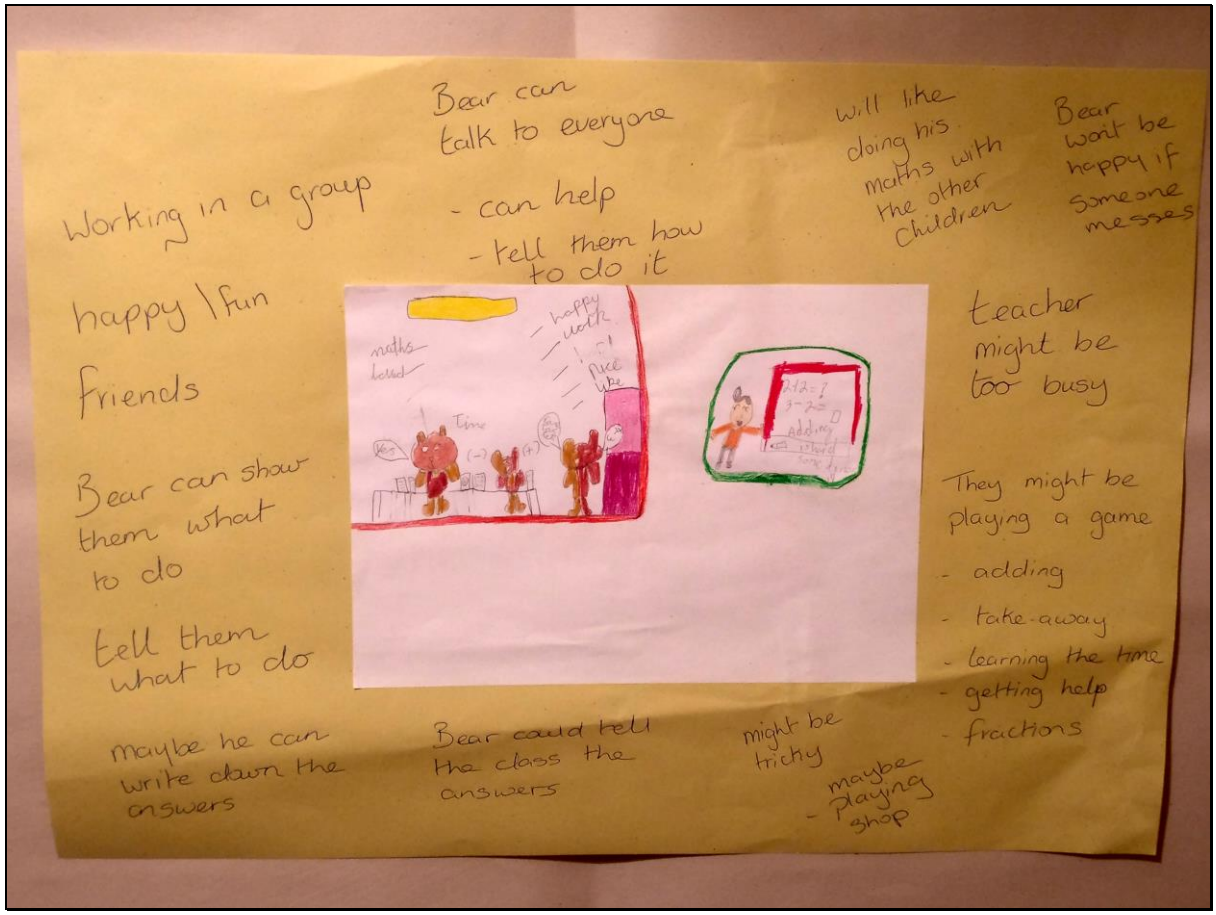
Appendix 9 - Representation of 'Bear' using concrete resources



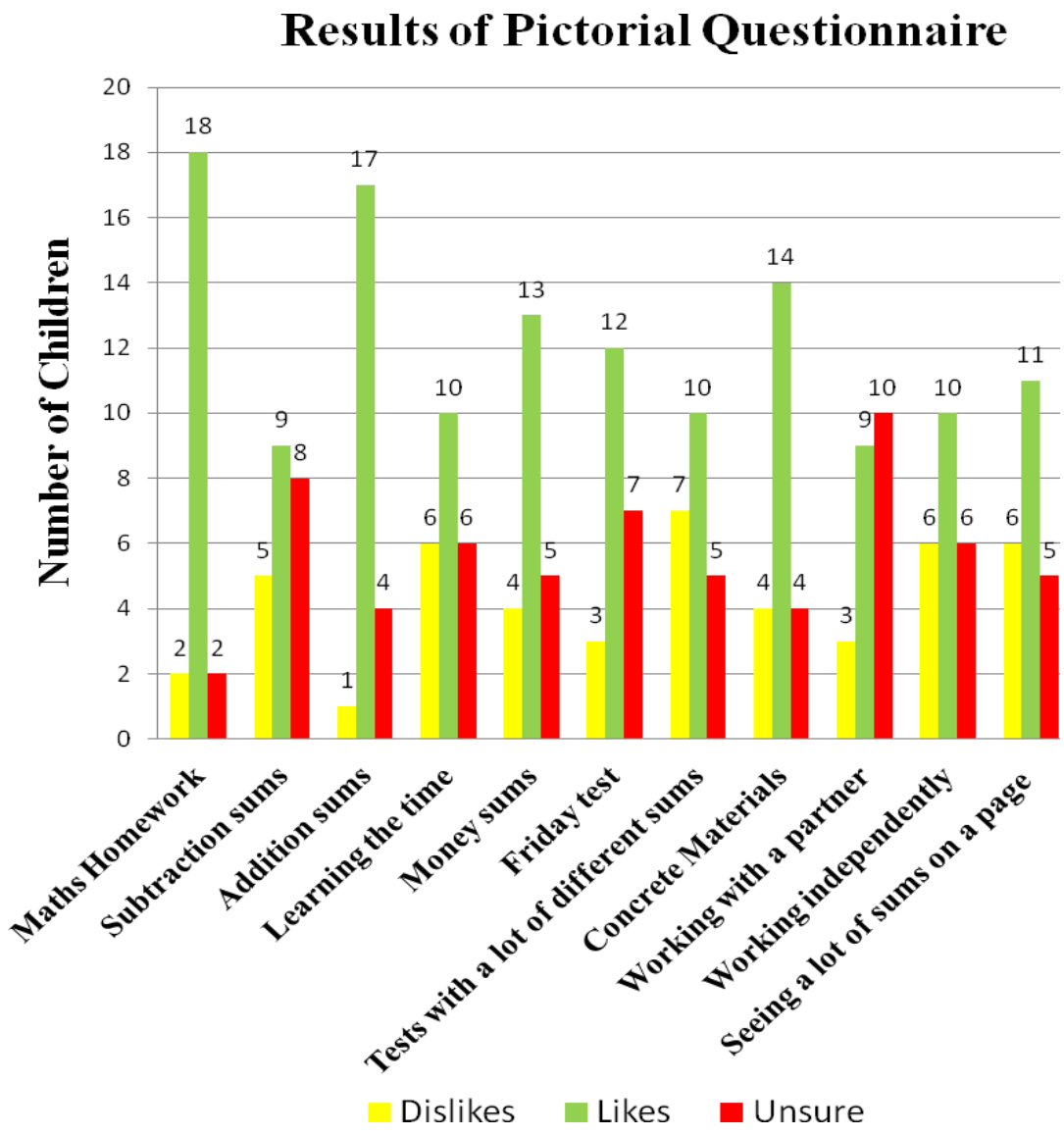
Appendix 10 - Representation of concrete resources that support learning



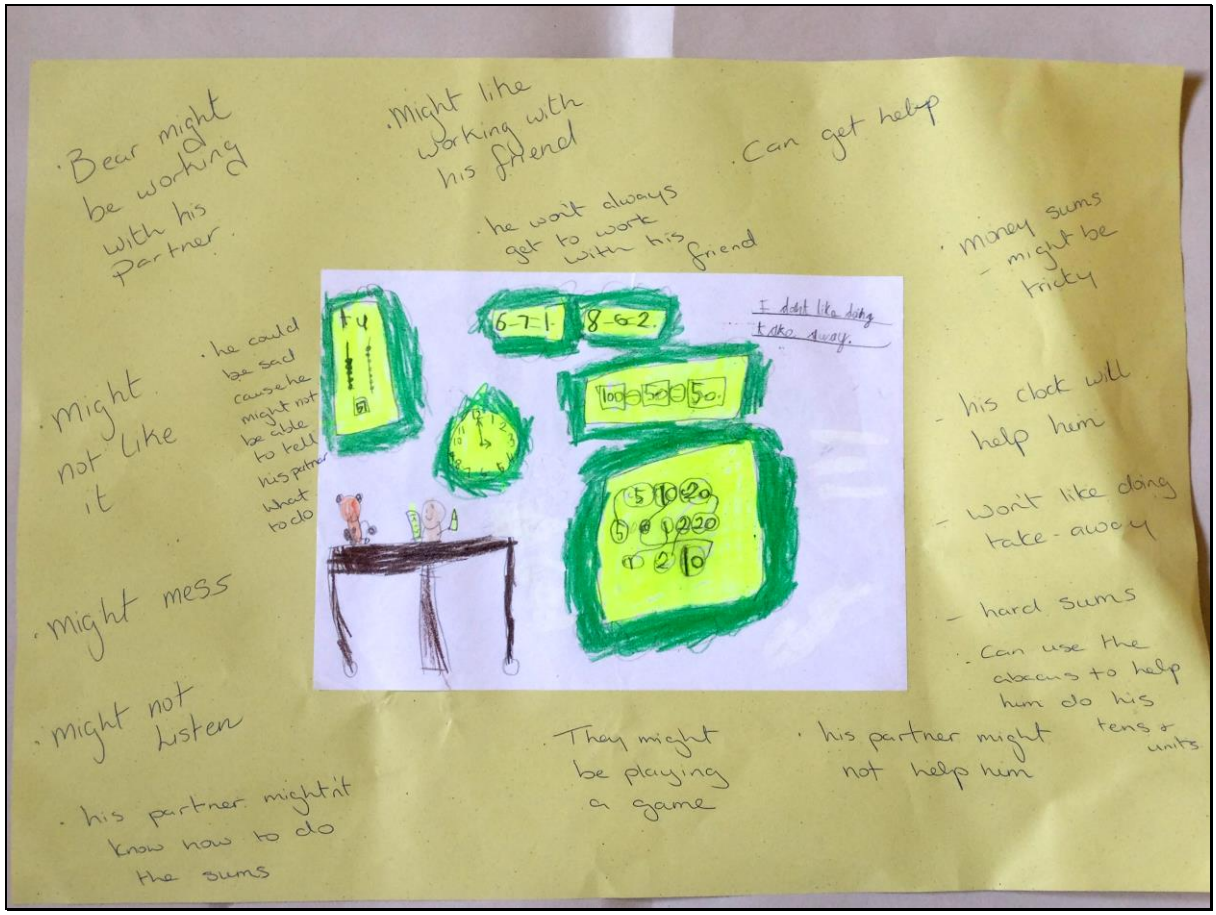
Appendix 11 - Representation of 'Bear' working in a group



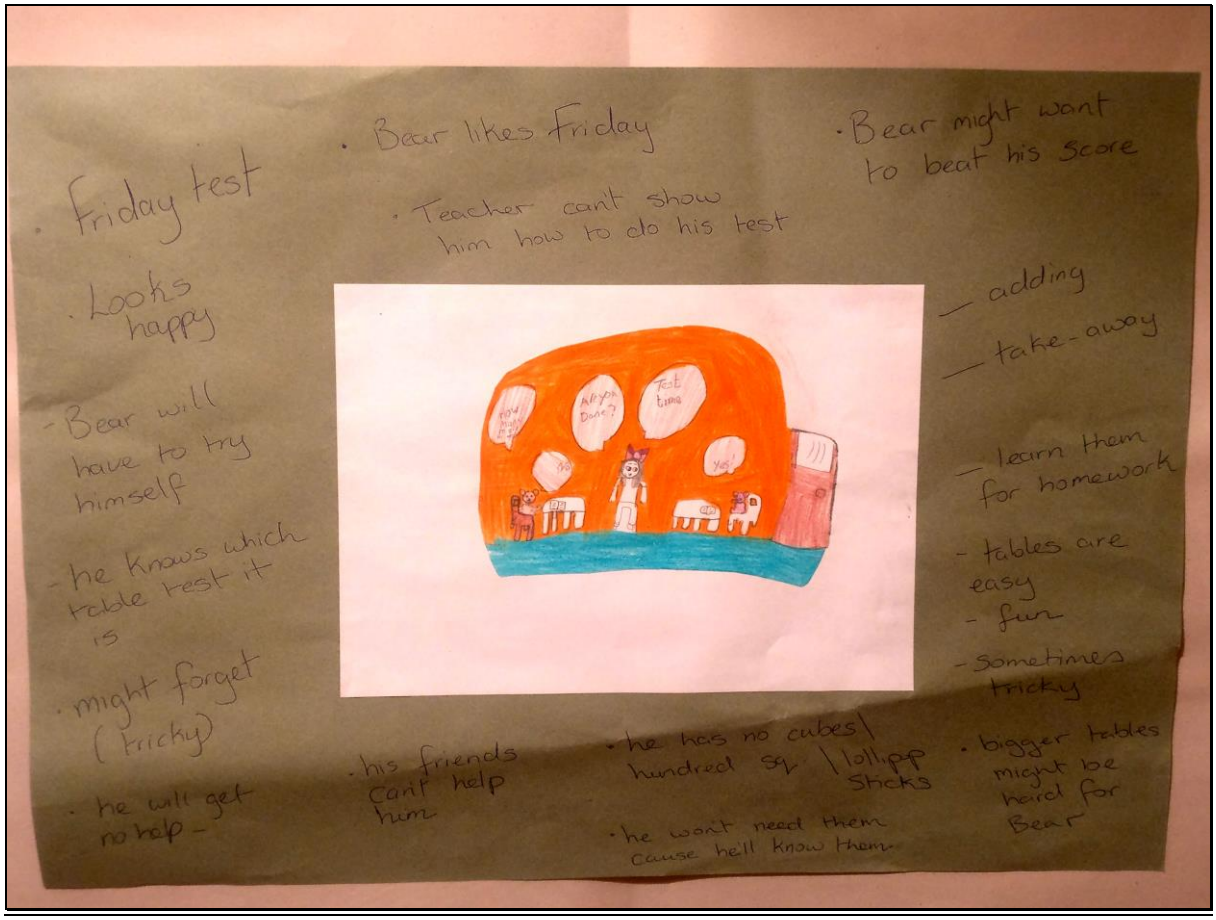
Appendix 12 – Results of the Pictorial Questionnaire



Appendix 13 – Respresentation of 'Bear' working with a partner



Appendix 14 - Representation of 'Bear' doing a Friday test



Appendix 15 - Representation of 'Bear' doing word problems