Changing beliefs: An investigation into the effects of the Numeracy Project on teachers’ understandings of Year 7 and 8 children’s learning.

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ABSTRACT

This study reports on three teachers' initial perceptions regarding Year 7 and 8 children's understandings of fractions, decimals, and percentages and how these perceptions change as a result of involvement in the Ministry of Education professional development programme known as the Numeracy Project. An investigation into how aspects of classroom delivery that includes the use of concrete materials, classroom interactions, and grouping practices can change children's understandings of fractions, decimals, and percentages is also reported. The analysis indicates that children did not have the understanding teachers expected. Concrete materials were identified as something the slower children needed to use, and grouping practices favoured a whole class approach. Involvement in the Numeracy Project saw changes in perceptions and classroom practice. Teachers were able to identify realistic outcomes for children and showed a greater understanding of how children learn the concepts associated with fractions, decimals, and percentages. Flexible grouping, relevant use of concrete materials for all children, and focused interactions were identified as areas of classroom delivery that needed to be investigated further.

The report investigates the use of different formats in order to distinguish between current research and my voice as an experienced teacher and mathematics facilitator.

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INTRODUCTION

As a facilitator since 2000 in the Numeracy Project I have been involved in delivering a model of professional development that has seemingly made considerable difference to teachers’ understandings and beliefs about how children learn key mathematical ideas. This understanding has resulted in marked changes in the classroom delivery of mathematics. The Numeracy Project which originated out of concerns about New Zealand children’s performance in the Third International Mathematics and Science Study (Garden 1997a, 1997b) has three key aims. These aims are raising expectations for learners’ progress and achievement, lifting professional capability, and developing community capability. The professional development offered to teachers is for two years, and involves workshops and in-class modeling as well as the provision of resources (Higgins, Parsons & Hyland, 2003).

In this research project I focused initially on teachers’ perceptions of the knowledge children at Year 7 and 8 would be expected to have about fractions, decimals, percentages, and classroom delivery prior to involvement in the Numeracy Project. These perceptions and classroom delivery practices were revisited after teachers had worked through the Numeracy Project. I was looking for changes in teachers’ understandings that might occur as a result of involvement in the Numeracy Project.
The research questions are:

1. What are Year 7 and 8 teachers' perceptions regarding the development of understandings related to fractions, decimals, and percentages?

2. Which aspects of classroom delivery foster change in children's understandings of fractions, decimals, and percentages.

I chose teachers of Year 7 and 8 because at this level they would be expecting children to have some understandings of fractions, decimals, and percentages. Fractions, decimals, and percentages are also clearly identified in Level 3/4 of Mathematics in the New Zealand Curriculum, [MiNZC], (Ministry of Education, 1992). Teachers would traditionally be expecting Year 7 and 8 children to be working at Level 3/4 of the curriculum. My experience as a facilitator and National Coordinator in the Numeracy Project has shown that teachers of Year 7 and 8 children do not necessarily understand or appreciate the lack of knowledge children have in this area of numeracy. Research findings of the Numeracy Project (Higgins, 2001, 2002; Irwin, 2002; Thomas & Ward, 2001, 2002) clearly indicates an area of weakness in children’s mathematical understanding of these mathematical concepts. Crooks and Flockton (2001), in data gathered from the National Education Monitoring Project, also identified a weakness in fractions, decimals, and percentages.

Aspects of classroom delivery that are considered in this project include the use of resources, in particular concrete materials, questioning skills, classroom interactions, and grouping practices.

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In the material that follows, italic text represents my understandings as an experienced teacher, adviser, and facilitator in the Numeracy Project. One reason for undertaking this research is to find ways to research my own practice as a teacher educator. Within the kind of research I have undertaken it is important to recognize the voices of practitioners, my own included.

I entered this project believing the use of concrete materials and grouping practices were under utilised in Year 7 and 8 classrooms. Questioning as a skill has also been something that has been neglected due in part I believe to the pressure teachers feel to cover all aspects of MiNZC and simply, “get through the material.” From my experience, open-ended questioning will expose a variety of ways a problem might be completed that can result in teachers feeling non confident, particularly if there is an issue with their mathematics content knowledge.

Classroom dynamics were discussed with the teachers in this project as I consider such dynamics might influence how teachers are able to implement classroom programmes.
LITERATURE REVIEW

The key themes identified in this literature review consider the learning and teaching of fractions, decimals, and percentages, and how resources, classroom interactions, and grouping of children can affect the development of children’s understandings. The influence professional development can have in changing teacher practice is also discussed.

Children’s understanding of fractions, decimals and percentages and the implications for teachers

Researchers Kieren (1995); Pitkethy and Hunting (1996); Rowan, Payne, and Towsley (1990), identify that understandings associated with fractions are complex and pose difficulties for children.

I discuss below in more detail a number of research findings which help to explain the complexities for both children and teachers in the learning and teaching of fractions, decimals, and percentages.

Pitkethly and Hunting (1996) identify that a common goal of research projects in the area of fractions was to help children to develop clear understandings that are based on sound and durable fraction concepts. Rowan, Payne, and Towsley (1990), suggested these understandings require strong connections between and among fractional symbols, models, and diagrams. The learning of fractions involves learning about two different
models – discrete and continuous. The continuous model involves repeated and varied division strategies whereas the discrete model involves dealing and counting strategies with less of an emphasis on the whole.

Hunting (1989) notes that many continuous models used in teaching do not involve children developing their own procedures to sub-divide quantities which can in turn lead to the false assumption that children can apply their knowledge in a variety of situations. The importance of social activity is also considered by Davis and Pitkethly (1990) and Kieren (1995) who note that experience forms a basis for formal knowledge development. Through these activities the deeper meanings for fractions can begin to be taught.

Literature is divided as to the influence whole number understanding has on children’s ability to understand fractions. Ball (1993); Neuman (1993); Streefland (1993) argue that whole number ideas do inhibit the development of fraction concepts. Kieren (1995); Steffe and Olive (1993) suggest that whole number concepts can be used by children as they construct initial fraction

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concepts. Children begin to use fraction concepts through sharing at a young age.

One aspect of exploring children's understandings of fractions, decimals, and percentages is through misconceptions. Irwin (1999b) has completed a number of studies in the area of decimal understanding with a particular focus on common misconceptions. I presented and discussed Irwin's research (1999b) with project teachers in order to further develop possible teaching approaches that might prove effective with some children. The research itself has a New Zealand context, is age specific, and develops the use of practical examples that could be readily applied in the classroom.

Irwin (1999b) concludes that students bring a wealth of concepts about whole numbers, which they in turn apply to decimal understanding. Many of these concepts do not work for decimals. In order to assist students to go some way to overcoming these misconceptions, Irwin has used meaningful contexts within teaching practice. Hart (1981) also states that students cannot simply rely on rules when working with decimals. Hughes (2000), concurs with Irwin that everyday settings in decimal use, namely money and measurement can actually reinforce whole number misconceptions. Both researchers recommend the teaching of problems that have sufficient difficulty to force students to use and question strategy and answers. Askew and William (1995) quote empirical

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evidence that identifies learning as being far more effective when common misconceptions are addressed. They state that questioning, observing, and listening to children allows teachers to detect errors and misconceptions in the first instance. If children are encouraged to think about what they are doing, then an opportunity to reason and challenge misconceptions is encouraged. There is also the chance to follow and challenge the reasoning of others.

Darling-Hammond (1998); Higgins (2001, 2002); Irwin (2002); Thomas and Ward (2001, 2002) also identify strategies for improved teaching that include the need to connect teachers’ work with their students, consideration of the subject matter, and development of effective teaching methods.

In the first year of the Numeracy Exploratory Study, Irwin (2002) identified that the initial data collected regarding children’s understandings of the tasks assessed showed little difference in understanding between Years 7, 8, and 9. Irwin’s report showed that many children could not read or identify fractions in the first instance and that teachers were surprised at the

I found the results from the classes of the three teachers involved in this project were consistent with those reported by Irwin (2002).
large numbers of students who could not find a fraction of a whole number and/or appeared to have little concept of how to even begin to solve the problem.

By the end of the project 45% of children had made significant progress. Irwin (2002, p. 40) stated, “this was a great credit to the teaching done in the project”. Once a teaching intervention had been put in place, a good proportion of both Year 7 and 8 children made noticeable gains after one term of involvement in the Numeracy Project (Irwin 2002).

**Classroom delivery**

*Use of resources*

A modified Pirie and Kieren model (2000) served as a basis for the teaching of new strategy concepts within the Numeracy Project. Key concepts developed in the Pirie and Kieren model state that children have a core of understandings that they bring to a topic. Teachers are encouraged to recognise and build on

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children’s existing knowledge and strategies in order to encourage the development of new understandings. The use of appropriate materials is emphasised with children when initially introducing new concepts.

In my experience, many Year 7/8 classrooms have little or no equipment. My work with teachers of Year 7 and 8 children has emphasised the initial use of concrete equipment with children.

In the modified Pirie and Kieren model (2000), once children have had sufficient practice to meet their needs with the materials then the principle of imaging is used as a teaching tool. Children no longer have the actual equipment to use but have a picture in their mind of the equipment. The next phase is to encourage children to notice and use the properties of numbers. The number size is increased to discourage imaging. Children will “fold back” to previous stages as they develop concepts. The process described above should lead to the development of new knowledge and strategies.

Carr and Treffers (1996), in discussing the work of the Freudenthal Institute, also reinforce the use of concrete experiences as a means by which children can test and consolidate ideas. In order for such experiences to have maximum effect, teachers need to ensure children are making links from the concrete material to the mathematical concepts being developed.
Begg (1998) also recognises that teachers need advice on both the potential and shortcomings of the equipment used. If advice is to be effective it should be associated with teacher professional development. This will allow teachers to make informed judgements and create ownership of the teaching and learning.

Resource development in mathematics has historically relied more heavily on textbooks than any other subject. Begg (1998) identifies that textbooks and resources have been provided extensively to teachers and yet mathematics is still a subject that creates anxiety with both children and their teachers. Textbooks are used by virtue of being available. He argues that the first form of resource development should

The professional development offered to teachers in the Numeracy Project actively made the links between the effective use of equipment and positive mathematical outcomes for children.

In my experience as an adviser and facilitator of numeracy, many Year 7 and 8 classrooms lack sufficient suitable concrete equipment for children at this level. Traditionally most Year 7 and 8 classrooms have a class set of textbooks that tend to be used extensively. Recognition that all children regardless of age may require the use of hands on equipment has been identified as an important part of the delivery of the Numeracy Project.

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be teacher development that is linked to curriculum development and research.

*Questioning and classroom interactions*

A number of researchers have identified the importance of interactions, reflection, and the connection of ideas in the effective teaching of mathematics. Askew (2001) highlights the need to consider interactions with children and the teaching tools available to teachers in order to support maximum opportunities to participate and engage. He identifies four key areas in the effective teaching of mathematics. These key areas are the tasks that children participate in; the social interactions and classroom norms that have been established; the artifacts and symbols, such as texts and equipment that are used; and the talk that is encouraged and built upon. How these key areas are developed in the teaching of mathematics is dependent upon what Askew calls “orientations.”

The three orientations identified are connectionist, discovery, and transmission. Askew particularly focuses on the connectionist orientation that has as an emphasis on teachers and children actively discussing the practices of mathematics.

Anghleri (2000); Lampert (1990); Young-Loveridge and Wright (2002) extend and elaborate on the teacher’s place in developing children’s understanding. The importance of children making connections through focused teacher questioning and inquiry is developed. In mathematics
classrooms children need to be given the opportunity to verbalise, create, and draw understandings with the expectation that they will be able to defend such work particularly if it involves a conventional algorithm. Young-Loveridge and Wright (2002) discuss the change in the teaching approach in mathematics that has evolved in the Numeracy Project, with a move away from an anti-interventionist approach to the need for direct acts of teaching. Cobb, Boufi, McClain, and Whitenack (1997) also highlight the importance and power of reflective discourse. This is defined as discussion that further extends children thinking about mathematics and creates conditions for mathematical learning to occur.

*Group Teaching*

Results from Higgins (2002); Irwin (2002); Thomas and Ward (2002) have all indicated significant gains for the majority of children as a result of the teaching to indicated needs in a group situation.

Teaching in ability groups is an area that is identified and reinforced within the Numeracy Project. The Diagnostic Interview (Ministry of Education, 2001b) gave teachers the information to ability-group children in knowledge and strategy. Teachers in this Research Project ability-grouped their children as a result of information gained from the Diagnostic Interview. (see Appendix A).
There is some debate about the use of ability grouping to improve outcomes for children. Askew (2001) discusses a study that considered the effective teaching of numeracy and teachers’ pedagogical practice. He found that it was not how children were grouped that was significant. The significant factors appeared to be in teachers’ understanding of the relationship between teaching and students’ learning of numeracy, how teachers interact with pupils, and how teachers support children’s participation in mathematical activities. Those teachers who were judged to be highly effective displayed variety in how they organised their classes for mathematics teaching. Some worked with the whole class, some in groups, and others used a more individualised approach. This finding raises significant questions about the effect of grouping on the effective teaching and learning of mathematics.

**Professional development**

Burt and Davison (1998) reported on professional development models used by the Ministry of Education and identified that initially professional development was focused on individual teachers, as opposed to whole school or syndicates. The expectation was that selected individual teachers from schools would share their knowledge with whole school staff. Significantly, the introduction of MiNZC was delivered in this manner with mixed results. Gilmore (1994, cited in Davison & Burt, 1998) reports on the success of individual teacher development and found that where whole schools, clusters,
or departments were involved in professional development, greater progress
was made toward implementation.

The whole school / cluster model incorporates in-school facilitator visits,
workshops both on and off site, and cluster meetings. All of these factors have
been included in the delivery of the Numeracy Project with two important
differences. Firstly, the Numeracy Project has included as part of the delivery
model, classroom visits with the facilitator modeling and then discussing good
practice. This is completed at least three times over a sustained period. This
factor has been identified as significant for teachers (Higgins, 2001; Irwin,

The second difference from previous development models is the upskilling
of teachers' pedagogy and content knowledge in mathematics. The Numeracy
Project develops both the Number Framework (Ministry of Education, 2001a)
and the Diagnostic Interview (Ministry of Education, 2001b) both of which
identify clearly for teachers how children might develop mathematical
understandings. This upskilling of pedagogy and content knowledge is
undertaken in a great deal more detail than within MiNZC and associated
documentation. The Diagnostic Interview serves as a platform for teachers to
begin to develop further their own content knowledge and to challenge their
own beliefs about what children actually know.

Darling-Hammond (1998) discusses a number of strategies they believe
improves teaching and learning. Strategies included the need to connect
teachers' work with their students in a practical way, along with an examination of the subject matter and teaching methods. The implementation of the identified strategies of connection, subject matter, and teaching methods is both sustained and intensive, and is undertaken through coaching, modelling and problem solving.

In Thomas and Ward's (2002) research associated with the Early Numeracy Project, it is recognised that what teachers know about mathematics and students affects all core-teaching tasks. The knowledge gained will influence the activities and resources selected, presentation of material, interactions, and assessment practices. Higgins (2001, 2002) also found that teachers had reported a greater understanding of number and, as a result, had modified teaching practice. These findings have been echoed in this research project. Parsons (2001), in a Ministry of Education policy paper, also highlights the need for strategies to support teacher learning in professional development programmes.

Reference is made by Irwin (2002), in research associated with the Numeracy Exploratory Study, to the possible parallels between teacher content knowledge and the quality of teaching associated with these concepts. Irwin (2002) also reports that the Numeracy Project is worth continuing, having been shown to benefit both teachers and students. The question of the sustainability of changes made by teachers has not, however, been addressed. Fullan (1991)
argues that the process of change is not considered successful until practices have become institutionalised.
METHODS AND SOURCES OF DATA

Application of research to personal practice

One of my personal aims in completing this research project was the application of research to my professional practice and the professional practice of the teachers I work with. I have chosen to record the literature review findings in a column format that reflects current research and my own experiences as a teacher researcher. My justification for this format is to use a writing style that will assist a practitioner audience to make connections to the research and their own practice as well as allowing me, as the researcher, to draw on my own personal experiences.

Dadds and Hart (2001) found that while practitioner research draws on traditional methodologies, these same methodologies allow ideas to be developed into something more individual. “Methodologies are designed primarily to improve the circumstances for those for whom the practitioner holds responsibility - children, parents, communities - it matters how this work is supported and conceptualized” (p. 8). They also state, “Innovation, far from transgressing the norm, ought perhaps to be accepted as a more natural, necessary and legitimate part of any open-minded research culture that is seeking to enhance quality” (p. 167).
Ethical Considerations

Prior to the commencement of data gathering, each teacher was approached informally about their involvement in this research project. Ethical approval was sought and gained from the Christchurch College of Education Ethics Committee before teachers, principals, and Boards of Trustees were given a formal written overview and written permission was granted (see Appendix B). In order to protect the privacy of teachers in this research project, teachers have been given other names and referred to as Joanne, Lauren, and Walter. The names of schools have not been used.

Participants

The participants were three Year 7-8 teachers in three schools from my Numeracy Project cluster. All teachers had composite Year 7 and 8 classes. Teacher selection was not random. I chose teachers who differed in a number of variables (see Table 1)

Table 1

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<td>Teachers</td>
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<td>Joanne</td>
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<td>Lauren</td>
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Data Gathering

Three observational case studies were used and generalisations were made using all three case studies. Burns (1995) notes that the selection of an observational case study method can be artificial because the group concerned is only a small part of a whole. In order to lessen any distortions, the group to be studied needs to have a distinct identity of its own and have sufficient membership.

Data gathering for each of the three case studies included two semi-structured interviews and one participant observation in teachers' classrooms. Each semi-structured interview was taped and transcribed. I also worked in each teacher's classroom four times in my role as numeracy adviser.

Semi-structured interviews are described by Neuman (1997) as field interviews which are produced jointly by the researcher and person being interviewed, and could be described as being close to a friendly conversation with an explicit purpose. Such interviews involve the sharing of mutual experiences and should ask questions in terms of concrete examples. Burns (1995) notes a number of advantages of semi-structured interviews compared to questionnaires and structured interviews. These being flexibility, an increased response rate, greater interaction, and the ability to observe non-verbal responses.

The first semi-structured interview with teachers was completed early in July 2001, and transcribed. The first interview, referred to as "July," was
completed after teachers had been introduced to the both Number Framework (Ministry of Education, 2001a) and Diagnostic Interview (Ministry of Education, 2001b). Teachers had also completed some initial testing of children in their class. The aim of the first interview was to establish teachers’ perceptions regarding the development of children’s understandings of fractions, decimals, and percentages. How teachers currently delivered mathematics was also discussed with particular emphasis on resourcing and grouping practices (see Appendix C).

A second interview with teachers was conducted in September 2001 (see Appendix D). Teachers had been involved in a series of workshops, in-class demonstrations of best practice, and had retested the children in their class using the Diagnostic Interview. Quotations from this interview are referred to as “Sept”. The audiotapes of this interview were transcribed (see Appendix E).

Participant observation was completed in each teacher’s class. The aim of the participant observation was to visit the classroom on a less formal basis than that required by facilitator visits and discuss with children their understandings of fractions, decimals and percentages. The participant observation also gave me, as researcher, an opportunity to observe the overall programme delivery of mathematics, classroom dynamics, and the use of mathematical equipment. The information gathered was discussed with the teacher at the time, and at the second interview.

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As Burns (1995) suggests, the use of participant observation allows researchers to involve themselves in the activities of the group without the group necessarily being aware thus I obtained informal data that might not otherwise be collected.

On completion of data gathering, all transcripts were read many times and key themes identified as they related to the research questions. The transcripts from each teacher were then cut and pasted under key headings with commonalities and differences noted. The outcomes from this process form the basis for discussion in the results and analysis section of this project.

**Bias**

Burns (1995) identifies bias as a major problem in participant observations due to researchers becoming too closely involved. Due to the fact I was both facilitator and researcher for the teachers involved in this research project, and worked closely with two of the teachers prior to the Numeracy Project, there was certainly potential for bias.

In this project, bias may have been reflected in teachers’ comments while speaking with the researcher. Teachers may have felt they needed to tell me, as the researcher, what they thought I wanted to hear. Neuman (1997) refers to this as the courtesy bias. This might have included such things as the “Numeracy Project being wonderful,” even if the teachers had reservations about implementation, workload, the need to change teaching methods, and outcomes for children.
As the researcher, I acknowledge the above issues and the fact that this may have influenced the outcomes reported. Due to the very real potential for bias, there was a need to ensure that changes and outcomes for teachers and students was witnessed as well as heard. As facilitator, I visited each teacher’s classroom at least four times. The purposes of these visits were varied and included me as the facilitator modelling a particular strategy, watching the teacher modelling various strategies, and participant observation. On each occasion I discussed at length the outcomes of the programme with teachers and, in some cases, the children. Throughout the visits and discussions teachers’ actions indicated to me, as the researcher, that they were being honest about the outcomes and changes for themselves and their students. I witnessed over a period of time change in teachers’ perceptions regarding the development of children’s understandings relating to fractions, decimals, and percentages. There were also changes and developments in the classroom delivery of mathematics.

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RESULTS AND ANALYSIS

The analysis of the data has been completed under three key headings:

1) Teachers’ perceptions about students’ knowledge and the resulting changes to teaching practices.

2) Teachers’ perceptions about the effectiveness of equipment with different groups of children.

3) The value of grouping within the mathematics programme.

Teachers’ perceptions and resulting changes to teaching practices

All three teachers expected children to have an understanding of basic unit fractions and decimal place value up to hundredths, as well as some knowledge of equivalent fractions and the ability to apply this knowledge.

I expect children to have a good understanding of fractions in terms of halves, quarters etc and an understanding of simple equivalent fractions. I would also expect them to be able to add and subtract unit fractions. (Joanne, July)

I expect kids to come in knowing that decimals were parts of a whole and that there were bits that came after the decimal point so to speak. I would also expect children to know that fractions are parts of a whole. (Lauren, July)

I would expect children to be able to divide things into quarters, tenths etc and to realize that this is to do with sharing. They should know about tenths and hundredths. I am not so worried about thousandths. (Walter, July)
The outcomes discussed by teachers reflected key directions for the teaching of fractions, decimals, and percentages as outlined in Level 3 and 4 of MiNZC.

Walter expected only the able children to fully grasp fractions, decimals, and percentages.

I expect the extension children and those above average will be able to see the tie between fractions, decimals, and percentages and truly understand what a percentage is. I think a lot of children will miss the boat. (Walter, July)

The teachers individually assessed each child in his/her class on items identified in the Diagnostic Interview and found that their perceptions were in fact not true and children did not have the knowledge teachers expected. Each teacher found large numbers of children who only recognised halves and quarters. Children with this knowledge are considered to be working at Level 1 of MiNZC. This was far removed from the teachers’ expectations that children would be working at Level 3 or 4 of MiNZC. Many children could not order simple unit fractions nor find a simple fraction of an amount. Children did not recognise tenths and hundredths in decimal fractions and demonstrated the misconception that a tenth was smaller than a hundredth.

Teachers were surprised at the levels of understandings that had been identified by the Diagnostic Interview.
The concepts are just not there. I thought they would be. I wasn’t expecting miracles and I knew there would always be kids down there but I was genuinely taken back. (Lauren, Sept)

Lauren commented further about the gaps in children’s knowledge

I was amazed at where they weren’t at, more than where they were at. (Lauren, Sept)

Joanne spoke about the performance of particular children in her class.

I was surprised at who had strong understandings about fractions and who did not. Children didn’t seem to be able to say, “Well I know this so therefore I can do that.” (Joanne, Sept)

Lauren also commented on the fact that children did not seem to retain concepts that were taught.

I always felt that they would know what they were doing but they tend to forget so quickly. When you revisit it you think you’ve assessed as being known but they don’t know it at all. (Lauren, Sept)

The results of the two Diagnostic Interviews were something of a shock for teachers. The interviews offered teachers a unique opportunity to work individually with each child and pin-point children’s strengths and weaknesses regardless of perceived ability. In a busy classroom the tendency has been to give a pen and paper test and/or to test only those children who have a
perceived difficulty. The need to have more time available for diagnostic
testing was raised.

I wish I had two days each year to go through and test every child. We
only tend to test those children having difficulty. I had quite a few
surprises, children whom I thought had a good understanding did not.
(Lauren, Sept)

The three teachers were asked in the second semi-structured interview to
reflect on how their perceptions and classroom delivery had changed. Teachers
reported that they had altered some of their beliefs and understandings about
how children learn and the ways in which they might teach.

The big key was the way the numeracy set out the different steps. That
was the first thing, understanding that children had to do certain things
in order to move onto the next step. Prior to that I had just thought it
was counting and addition. I didn’t put much emphasis on place value.
Now I realise how important place value is. (Walter, Sept)

I would have spent less time on understanding, whipped straight into
operations and taught the rule. I didn’t do a lot with operations at all.
(Joanne, Sept)

I have not changed hugely in how I teach the lower groups. It is
different for the higher groups. I think I made assumptions that they
knew where they were going, but there were things they weren’t sure of
so I used concrete equipment more often with these children. (Lauren,
Sept)
Joanne, at the beginning of the Numeracy Project, tended to teach the whole class and then work with identified children who needed more teacher time.

This is an extension group so they are generally above average. I tend to teach the whole class and then have some exercise that sorts out the children who aren’t understanding. I work with these children while the other children practise examples. (Joanne, July)

On completion of the Numeracy Project, Joanne felt that she was being more precise in her teaching.

I did far more in front of a group, modelling, discussing. More of that type of teaching than I had done before. I would do whole lessons like this, whereas before I would do something for ten minutes and then set some practice. Children are not going to learn by just doing a multitude of things out of books, even if you have taught them, you know, taught them what to do. You ask a question and then when you get an answer you go a bit deeper and a bit deeper. They need more of that. (Joanne, Sept)

At the beginning of the Numeracy Project, Lauren expected all children would be taught fractions, decimals, and percentages regardless of their readiness.

I expect that children when they were doing the work would all know it, but they tend to forget it so quickly so when you revisit it what you think you’ve assessed as being known they actually don’t know. I worry about them getting bored. (Lauren, July)
On completion of the project, Lauren had recognised that children needed to have certain concepts in place and an extended period of time might be required for children to grasp the ideas being taught.

I kept them on fractions because they weren’t getting past that, whereas before I would have moved them onto decimals anyway. You have many opportunities to try different things to help children learn. It was almost like having the nod, you don’t have to move children on. I didn’t feel pressured to move them on to things I didn’t think they were ready for. (Lauren, Sept)

Walter at the beginning of the project did not tend to teach the extension group. These children completed work independently of the teacher.

New work generally will be met as a group. I will have a booklet for the extension group. They go away and look after themselves. (Walter, July)

On completion of the project Walter had included a range of activities into his teaching programme. These activities actively engaged all the children in the class including the extension group.

I have actually just taught the best volume unit ever. Children were using strategies from the Numeracy Project straight away. It was trying to get a range of activities. It worked well even though I didn’t think it would. It actually got my extension group going. There were a couple of my naughty boys in the extension group. (Walter, Sept)
Teachers’ perceptions about the effectiveness of equipment with different groups of children.

Prior to the Numeracy Project all three teachers had identified the use of materials as something the slower children needed to use.

The slow children work really well, I try to find them concrete materials and give them as much back up as possible. (Walter, July)

The equipment needs to challenge the children. If the equipment is too basic and simple it is not going to challenge children. I have a fractions board here but I don’t often use it. (Joanne, July)

As a result of involvement in the Numeracy Project, teachers used equipment with all children and appeared able to make informed decisions about the appropriateness of the equipment they used.

There were some things the able children weren’t all that sure about, so using concrete things is something that I wouldn’t have done in huge amounts before and that is how I changed. I remember what Confucious said about what you do you remember so I’m hoping that anything that they do physically with their hands will be followed through into greater understanding. (Lauren, Sept)

I was trying to get a range of activities. I would have less book learning and lots of concrete materials. (Walter, Sept)

The resources were particularly effective because they were selected for what the children needed specifically. We don’t have one text-book as

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such. I have copies of several and I fossick through and find specific things for specific groups. (Joanne, Sept)

The value of grouping within the mathematics programme

All three teachers, prior to involvement in the Numeracy Project, had some form of grouping practices in the teaching of mathematics in their classroom. Extension children were generally encouraged to work more independently.

I try and work with the slow children and those up around average. I have a booklet for the extension group to work in. They go away and look after themselves. (Walter, July)

Grouping varies. Sometimes you might come into the room and you might see groups working at different levels. The groups might be made up of those really struggling, a middle group, and a top group. It depends on what we are doing. (Lauren, July)

This is an extension class. I tend to teach the whole class and then have some exercises that sort out those children who aren’t understanding. I will work with those particular children while the others work on practice activities. (Joanne, July)

Classroom dynamics influenced how teachers worked with groups of children. Joanne allowed her children a degree of independence and flexibility as to the group they might work in.

This is an extension class. Generally speaking children evaluate whether they should be on the mat or not. They come and go as they want so it is pretty fluid. I have one or two children who are with me
most of the time because of a lack of confidence rather than anything else. If I am working in groups I tend to use cooperative grouping based on PAT results. (Joanne, July)

Walter discussed the impact a group of boys had on group teaching.

I tell you what actually impacts the most is I have a huge number of immature boys who actually ruin maths quite a lot. They probably dominate, it is a sad thing to say, I think that is what stops a lot of group work in my class – it is these four or five boys. (Walter, July)

As a result of information gained from the Diagnostic Interviews teachers made changes to their grouping practices. The outcomes of the Diagnostic Interviews also caused some surprises for teachers.

Joanne was surprised at the composition of her groups.

My children were in three groups. The test meant the groups were sorted before we started. The top group were amazing. The interesting thing was that if I had given them a pen and paper test that wouldn’t have been the group. I had a couple of kiddies who were slap dash and yet they had it all there. They lapped it up and were hugely enthusiastic, whereas they were normally just enthusiastic. (Joanne, Sept)

Lauren commented that the test had identified areas that needed to be taught.

I grouped them according to the level they were in the test. You knew where the gaps were so you could direct children to that straight away. It was well targeted. (Lauren, Sept)
Walter was surprised that the behaviour of the immature group of boys had improved as a result of the focused group teaching.

It worked well. The behaviour aspect actually worked quite well. I didn’t think it would but it was actually keeping them occupied, making sure they had work to do. (Walter, Sept)

As teachers became more confident they began to show flexibility in their approaches to the teaching and learning of mathematics.

Lauren discussed the ability to predict and make judgments confidently about children’s needs.

It will be nice to see if we can predict outcomes for children and then do the test to check our judgments. This is where the experience and knowledge will come in. (Lauren, Sept)

Joanne commented on how she felt more confident about the teaching of key fraction, decimal, and percentage concepts.

Because of the test I had far more idea of what the important things were for the children to understand. So I was more confident in them, well I think I was. Things that I would have glossed over before I now understand I might need to spend more time on. (Joanne, Sept)

Walter had developed a real interest in pin-pointing the key understandings that children needed to progress.

If children hadn’t made progress, why hadn’t they? What was still wrong with their basic mathematics? In the second test I went back and
retested everything the children had not scored well in. You could see they had some progress and what you needed to teach. (Walter, Sept)

Teachers were also comfortable discussing some of the challenges and changes for them as a result of being involved in the Numeracy Project.

Lauren commented that a number of disruptive children's behaviours had not really improved.

I don’t think you are going to like this answer. I think one or two were a little bit better but most of them were pretty much the same. (Lauren, Sept)

Joanne reflected on how she had been very focused on the teaching of rules and operations prior to the Numeracy Project, and how this had changed.

I would have whipped straight into operations and taught a rule. In fact I didn’t do a lot with operations at all and yet children could do it and understand. (Joanne, Sept)
CONCLUSION

This research project investigated three Year 7 and 8 teachers’ perceptions regarding the development of children’s understandings related to fractions, decimals, and percentages. The three teachers in this project had expectations of children’s understandings of fractions, decimals, and percentages in keeping with Level 4 of MiNZC. The expectations were that children would have a good knowledge of fractions with some understanding of decimals and percentages. Once diagnostic testing had been undertaken, it was clearly identified that many children were working at Level 1-2 of MiNZC.

Teachers participating in this research project were also involved in the Numeracy Project. As a result of their involvement in the Numeracy Project teachers appeared more able to listen to their pupils and recognise the levels of understandings that children bring to mathematics. As teachers became more confident they began to show flexibility in their approaches to the teaching and learning of mathematics, and were better able to identify realistic outcomes for individuals and groups of children. Higgins (2001, 2002); Thomas and Ward (2001) identified in their research that greater understanding of teaching and learning by teachers leads to changes in teaching practices and core tasks.

Aspects of classroom delivery that foster change in children’s understandings of fractions, decimals, and percentages were investigated with the focus being on the use of concrete materials, classroom interactions, and
grouping practices. Askew (2001) draws our attention to the fact that successful teaching of mathematics is not necessarily about groups but about teachers’ relationships between teaching and student learning. I suggest that the Number Framework (Ministry of Education, 2001a) and Diagnostic Interview (Ministry of Education, 2001b) helped teachers to identify key content children needed to develop in order to learn fractions, decimals, and percentages. As a result of this knowledge, teachers began to teach in focused groups, grouping became more flexible, and interactions with children more meaningful. Teachers also began to make informed judgments about the strengths and weaknesses of certain resources as identified by Begg (1998). This was evident in the selection of appropriate equipment being used with all children regardless of ability.

While undertaking this research project, I was also the facilitator of the Numeracy Project for the three teachers concerned. One of my aims for this project was to link research to my professional practice and the professional practice of teachers. I have experimented with allowing my voice as a facilitator to have a place. By using italics within the text I have tried to provide insights into the understandings and assumptions that I personally bring to this work. By creating two voices, I have tried to show that the task of being both a facilitator and a researcher is compatible and needs to be seen as compatible with practitioner research. By reporting in two voices I have made this distinction clear to the reader.
This project has raised questions regarding teacher knowledge and understanding about the teaching and learning of mathematics and the impact such understandings have on the classroom delivery of mathematics. The fact that two of the teachers in this project had considerable teaching experience at Year 7 and 8, and still held perceptions of children’s understandings that were unrealistic, provides important challenges for those involved in research and professional development. Further investigation is needed into professional development models that challenge teachers’ current understandings with clear links to the delivery of mathematics in teachers’ own classrooms.
REFERENCES


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Appendix A

A summary of the purposes and content of the Diagnostic Interview
A summary of the purposes and content of the Diagnostic Interview

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The Diagnostic Interview has two purposes. One purpose is to allow teachers to identify the strengths and weaknesses of children in areas of knowledge and strategy. The second purpose is as a training tool for teachers to begin to better understand the Number Framework.

The Diagnostic Interview is made up of two parts, knowledge and strategy, and tests children’s understandings of whole numbers, fractions, and percentages. In the area of knowledge, children are questioned about numeral recognition, number order and sequence, grouping and place value, and basic facts. Strategy questions focus on addition/subtraction, multiplication/division, and proportions/ratios.

The Diagnostic Interview has been modified over time. The Diagnostic Interview used by the three teachers in this research project tested the knowledge of fractions, decimals, and percentages. Strategy questions focused on proportional reasoning.

Once the Diagnostic Interview is completed with each child, teachers are able to place children on the Number Framework that identifies what children understand and the direct teaching that needs to be undertaken.
Key questions asked by teachers in this Research Project

The questions in the Diagnostic Interview become progressively more difficult in each section. Teachers discontinue a particular section of the Diagnostic Interview if children do not understand the concepts being asked.

*Fraction and Decimal Knowledge Questions.*

In this section there is a minimal amount of questioning.

1. Recognition and reading of unit fractions e.g. 1/2, 1/4, 1/3, 1/5, 1/6.
2. Ordering of unit fractions.
3. Ordering of fractions with different numerators and denominators.
4. Identification of decimals to three decimal places.
5. Ordering of fractions, decimals, and percentages.

*Strategy Questions*

Children are asked to explain their reasoning in all strategy questions. Pen and paper is not provided or encouraged.

1. Finding a fraction of a number using addition / multiplication facts e.g. 1/3 of 12 as 8+8+8 or 3x8.
2. Finding a fraction of a number using multiplication and division e.g. 3/4 of 28.
3. Application of proportional reasoning: It takes 10 balls of wool to make 15 beanies. How many balls of wool does it take to make 6 beanies?

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4. Application of an understanding of percentages: There are 21 boys and
14 girls in Ana's class. What percentage of Ana's class are boys?
Appendix B
Ethical Approval

Ethical Approval was gained from the Christchurch College of Education Ethics Committee on July 2001
Dear

As part of my study within the Master of Teaching and Learning degree at the Christchurch College of Education I am completing a Research Project.

My research will be considering the professional knowledge teachers have regarding children’s understandings of fractions, decimals, and percentages and aspects of classroom delivery that foster these understandings.

The research findings may be shared with the Ministry of Education and project facilitators for planning and programme development. Confidentiality of your school and participating teachers will be assured with different names being used when data is being reported and findings presented.

Teachers involved in this Research Project will be asked to:

- Complete the requirements of the Numeracy Project as identified by the Ministry of Education. This has already been discussed with teachers.
- Give informed consent to be part of this project.
- Complete two semi-structured interviews that consider the key research questions. It is intended that the first interview be completed in term one. The interview should take no longer than fifty minutes. The aim of the first interview is to consider teachers’ perceptions regarding children’s understandings of fractions, decimals, and percentages. The second interview will be completed late in term three and will reflect on developments and changes that have occurred in teachers’ and children’s understandings.

Teachers in this research project have the right to withdraw at any time.

Sue Graham
Research Project
Thank you for taking the time to consider my request.

Yours sincerely
Sue Graham
Numeracy Facilitator
Christchurch College of Education

My supervisors for this project are:

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Elaine or Jane are happy to answer any queries.
Research Project
Consent Form
Board of Trustees

Name: 
Position: 
School: 
Phone: 

I am / am not willing for School to participate in the Research Project being completed by Sue Graham.

I understand that confidentiality will be observed at all times.

I understand that teachers involved in this Research Project can withdraw at any time.

Please indicate by signing that you have read the overview for participating schools and that you fully understand and agree with what is being proposed.

Signed

Sue Graham
Research Project
Dear

Thank you for agreeing to take part in my Research Project. This letter is to formalise the agreement and reiterate what is involved.

As part of my study within the Master of Teaching and Learning degree at the Christchurch College of Education I am completing a Research Project.

My research will be considering the professional knowledge teachers have regarding children's understandings of fractions, decimals, and percentages and aspects of classroom delivery that foster these understandings.

The research findings may be shared with the Ministry of Education and project facilitators for planning and programme development. Confidentiality of your school and participating teachers will be assured with different names being used when data is being reported and findings presented.

As a teacher involved in my Research Project I am asking you to:

• Complete the requirements of the Numeracy Project as identified by the Ministry of Education. This has already been discussed.
• Give informed consent to be part of this project. Consent has also been sought from the Principal and Board of Trustees.
• Complete two semi-structured interviews that consider the key research questions. It is intended that the first interview be completed in term one. The interview should take no longer than fifty minutes. The aim of the first interview is to consider your perceptions regarding children’s understandings of fractions, decimals, and percentages. The second interview will be completed late term three and will reflect on developments and changes that have occurred in
your understanding of the teaching and learning of mathematics.

You have the right to withdraw from the Research Project at any time.

Thank you for taking the time to consider my request.

Yours sincerely
Sue Graham
Numeracy Facilitator
Christchurch College of Education

My supervisors for this project are:

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Jane McChesney
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Elaine or Jane are happy to answer any queries.
Research Project
Consent Form
Participating Teachers

Name:

Phone:

I am / am not willing to participate in the Research Project being completed by Sue Graham.

I understand that confidentiality will be observed at all times.

I understand that I can withdraw from the project at any time.

Please indicate by signing that you have read the overview for participating teachers and that you fully understand and agree with what is being proposed.

Signed

Sue Graham
Research Project
Appendix C

Questions prepared for first semi-structured interview: July
Questions prepared for first semi-structured interview:

Interviews with teachers will take no longer than one hour and will be audio taped

Mathematics Delivery.
- How does mathematics currently operate? What would a fly on the wall see? It was intended that this question would consider grouping, expectations, resourcing and classroom interactions.
- What are the dynamics within the classroom and how does this affect the teaching of mathematics?

Content Understandings
Note fractions and decimals to be asked separately but similar questions will apply.
- What (fraction, decimal) understanding would you expect/hope children at this level would have?

Any other comments? This might include any observations regarding the diagnostic testing that had already been completed.
Appendix D

Questions prepared for second semi-structured interview: September

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Research Project
Questions prepared for second semi-structured interview:
September 2001
Interviews with teachers will be no longer than one hour and will be audio taped.
A summary was completed by the researcher of discussions that were relevant from the first interview. This was brought into the interview as appropriate.

Mathematics Delivery

Teaching
- In what ways did your teaching of fractions, decimals and percentages change?
- What were the reasons for these changes?

Grouping
- What grouping practices have you used in undertaking numeracy work?
- What did you find successful/unsuccessful? Why?

Lesson Structure
- Were there any teaching approaches that you found more effective than others?

Classroom Dynamics
- Have you noticed any changes in the dynamics within the classroom as the numeracy programme has evolved?

Pedagogical knowledge
- In summary, what are the key understandings that you have gained about how children develop understandings associated with the learning of fractions, decimals, and percentages
Appendix E

Transcript of second semi-structured interview with Joanne
Transcript of the second semi-structured interview with Joanne: September.

Joanne just reflecting back and thinking about fractions, decimals and percentages. How did you go about teaching fractions?

Probably with more precision in terms of what I was doing with each group. I had...my children were in three groups and the top group of children were really...they knew everything there was to know basically about knowing about fractions so they worked on problem solving a lot and that was easy because they were so motivated that you just had to set them a problem and they just went. With the other two groups I did far more teaching. I modelled, talked about it, they had a go, there was more modelling. There was more of that type of teaching than there had been before. Before I might do something for 10 minutes and then set them to practise something. I didn't tend to do a lot of that at all. They tended to practise when they were working for the next day in their group. That is the biggest change I would say.

Prior to coming onto the numeracy project, would you have taught mainly as a whole class or used groups?

No, I wouldn't have them as a whole class but I would have had them as a whole class to start with the teaching of any new thing and discover who knew it and then set them off on something else. The difference now is that I had the groups sorted before I started rather than do it as I went, based on what I knew.

Are then any particular things that were highlighted for you in making these changes in how you actually taught fractions? Why did you decide to make these changes?

Because of the test, I had far more idea of what the important things were for children to understand. So I was more confident in the important things. ... well I think I was, for them to be able to do it and to understand. Things that I would have glossed over a bit before I suppose, like just something simple like the ordering of fractions. I wouldn't have spent very much time on that at all whereas I probably spent more time on that, knowing that if they had lots of other things followed. I didn't understand that before.

If we were just looking at resourcing, you mentioned fraction cards and dominoes last time as a useful resource and that you might use place value charts. Were there any particular resources you found particularly effective?

We made up place value charts. They were not very successful as it was hard to know what to do with the decimal point. You're not suppose to be moving the decimal point. The concept did work though. We ended up rather
than them moving things, having charts where they could write underneath like you’ve got empty number lines we had empty place value charts. The children could see the decimal point stayed in the same place and the numbers moved around it. We did quite a lot of that. I had a student at the time, she actually did all of that and I did the observing. I actually used those old fraction boards, you know those old fraction boards? But really as a visual … not … I didn’t use them, I just had them as a visual aid and the kids could quickly look and reinforce something they might need to know. That was quite useful. I didn’t use dominoes at all. When I started working with the children I found it easier to work from the front. I mean that is sort of old fashioned, you’d sort of told me not to do that but I found it the most effective thing to do. It got the kids motivated, I mean you were in my room, you saw they liked doing that sort of things and they were all on board. They were all into it and keen. I found that carried over.

*Why did you think the resources you used were particularly effective?*

Because they were selected for what the children needed specifically, and we were lucky here in that …. Well I think we are lucky because we don’t have a maths text-book, I’ve got about six or seven examples of print text books in my room of about ten each. I can fossick through and find specific things for specific groups. The only thing was I did run out of resources for the top group. You suggested things and I gave them those. They finished those … I found it quite difficult to find things that kept them going.

*Can we move on and have a look at decimals and percentages. We have touched briefly on decimals. How did you go about the actual teaching of decimals and how did that lead onto percentages?*

We moved from fractions. I did a lot of work on if this is a fraction, what is the percentage? I had three groups but I sort of had a top group and two groups who quite often worked together because they needed the same things and then they would move apart for other things. Because all the children know that a half is the same as fifty percent is the same as 0.5. It was quite easy to work from there. We did a lot of comparing and contrasting. I was fascinated by the question in the test where the children have got decimals they had to put in order and then you give them a fraction and a percentage to put in. There were only a couple of mine who got that right the first time. We did a lot of that sort of stuff, saying where would this one go? They enjoyed that, it was great fun and they felt like they were getting something out of it. The test results showed that I spent most of my time on fractions and decimals and understanding the relationship between them and what is bigger, smaller etc.

*How was this approach different to what you might have done before?*

I would have spent much less time on understanding and whipped straight into operations. I would have taught them the rule. In fact I didn’t do a lot of operations at all unless it was problem solving.
Did you find that children could work out the operations even though little time had been spent on them?

Yes, Yes it is funny you say that because I didn’t teach them how to multiply decimals and they could still work them out. 

What do you attribute that to?

Just that they understood them. Just that. I mean I would rather spend the whole year on doing that than doing anything with operations because I found that it added to their understanding of problems. They could translate that into a problem far easier than translating the rule for how to do or how to do that.

If we go back to grouping. You mentioned you had three groups working. Is there anything that you found particularly successful in using the three-group system, and anything that you were concerned about?

Thinking back, I probably could have two groups. One group would have been two thirds of the class. It was too unbalanced so I divided them into three for expediency rather than anything else. The top group were easy and hard to deal with. It was hard to find resources for them, but the teaching of them was easy because they picked things up very quickly and saw things. They had a good understanding of fractions and decimals and all of that to start with. We did a lot of stuff on ratios and they were like that. Once they got it, it didn’t matter what you gave them they could work it out. Sometimes I would be doing the same things with the other two groups and sometimes different. Sometimes I would invite children to come and join me on the mat... I’m doing such and such and if you want to come down you can. One little girl came to me because she thought she should be in a higher group. I put her in it, she was fine. She is not the sort of kid who does that sort of thing so I shifted her.

I found that apart from the odd child the grouping was right. I was surprised at who had strong understandings about fractions and who did not though. I don’t think there was anything particularly unsuccessful about the grouping. There was little sub groups within the groups. Some children needed a little more time. The grouping was flexible relatively speaking.

If we look at the lesson structure when we talked in the first instance you usually started with tables, mental questions and then moved into topic. You were going to use more concrete material.

I spent less time at the beginning, we didn’t do anything with tables for the whole time we were doing this, which seems funny. We did more of what we were doing when you came into the room, just three or four things on the
board, very quick, quick, quick and then into groups. That was the major change.

Looking at the dynamics of the class, you mentioned that perhaps it wasn’t the fact that they didn’t have the ability, it was confidence. Do you think their confidence levels had markedly increased or stayed the same?

I don’t know if it was confidence at the beginning with the year sevens. I just think it was because they didn’t know. I found out later through numeracy. I should have known this probably, some of the things they had not touched before at primary school and I hadn’t realised that. I hadn’t realised that you didn’t touch formally on percentages and a couple of other things I can’t remember. It might not have been confidence although they were nervous in the test. It was a bit like waiting to go to the dental nurse. You know how you wait for that?

They were very enthusiastic about the programme. I thought they were anyway.

Did children seem more enthusiastic about maths than previously?

The top group yes, they were an amazing group. The interesting thing is that if I had given them a pen and paper test then they wouldn’t be the same group. I tended to go on how they worked it out. I had a couple of kids in here who are a bit slap dash, and never got anything particularly right. They had it all going for them and they just improved out of sight in terms of their accuracy. They were just lapping it up. The group went berserk and they were hugely enthusiastic whereas normally they were just enthusiastic. The other two groups, it was funny they were competitive with each other. Quite often it was like the grass was greener, they would look at what they were doing and what someone else was doing and well think, I want to do that. They were actually keen to have a go at what the other kids were doing so there was enthusiasm, yes. I think we didn’t do a lot of practice. It was either working with me, and just thinking, or they were working on problem solving activities in groups, pairs or individually. There wasn’t a lot of grinding away at sum after sum. Which is good. I could possibly have a bit more practice.

Are there any key understandings that you might have gained about how children develop their understandings of fractions, decimals, and percentages. Some things that really stick in your head?

Children are not going to learn by just doing a multitude of things out of books, even if you have taught them, you know, “taught them,” what to do and then they go away and practice it. I think they need lots of... a bit like social studies, you ask a question and when you get the answer you go a bit deeper and a bit deeper. They need more of that... well if this number goes here in this order well what say I put this on it, what would happen to it then? Children didn’t seem to be able to say I know this so I can do that. We needed to work on that. That type of thing. There are some things you just need to
spend the time on. If they haven’t got it there is no point moving on. Okay you could move on and teach the rule. The kids would probably get the right answer but it wouldn’t mean anything.

*Any other comments?*

Yes now, this is interesting, this is testing. When my kids improved in the testing and some improved quite markedly. Partly that could be because the first time I tested them I was a bit tough. I tended even if they got them right I would ask how they got that? If they only knew a rule I would mark them down a bit. I always thought at an intermediate school if you wanted to look at the difference between a year 7 and a year 8, year sevens grow academically and the year eights socially. My year eights made bigger jumps than my year sevens. I haven’t quite explained that myself. I’m just wondering if the year eights are more ready for it or the year sevens are only being introduced to some things. I don’t know. It is definitely to do with the programme though. I had one boy who was away in America for three weeks. He didn’t move at all. He is okay but he stayed the same. He didn’t take part in quite a bit of the programme.