Isolating Students with Mathematical Learning Difficulties for Teaching Purposes: The New Zealand Experience

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ABSTRACT

A survey, by questionnaire, was carried out in seventeen school districts in three regions of North Island, New Zealand, to collect data on the extent of ability grouping for mathematics classes and the experiences of students in mathematics classes. Quantitative data were collected on schools' rationales for or against grouping, selection processes and the teaching programmes used for the lowest achieving students. Qualitative data were collected with respect to teachers' opinions about teaching the lowest achieving students and about the possible reasons for those students' low achievements.

The responses from Heads of Mathematics Departments indicate keen interest in best practice for low achieving students. A surprising 99% of respondents reveal that some form of ability grouping for mathematics is implemented in their schools. It is clear that ability grouping is seen as the best approach to meeting the learning needs of all students, whatever their level of achievement.

These results incorporated a wide range of schools including all year levels, state and private, large and small and all decile ratings from 1 – 10. Consensus on ability grouping within the wide range of schools in the three geographical regions suggests that schools throughout New Zealand also consider ability grouping as best practice for their low achieving students.

The research raises concerns about student self-esteem, motivation and maths anxiety. The need to address *those* issues as well as mathematical teaching and learning issues is imperative.

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Chapter 1

Introduction

1.1 Introduction

The enthusiasm that I have developed for students with mathematical Learning Difficulties stems from what I perceived as a massive ignorance of their learning needs, in a New Zealand school, two decades ago. When I first began teaching in New Zealand, in 1985, my classes were all 'remedial' maths. I was expected to keep the students busy – in other words, to baby-sit them and keep them out of trouble. When achievement and effort grades were handed out, my classes were only allowed the Cs, Ds and Es, (the top classes had the As, Bs and Cs; the middle classes had the Bs, Cs and Ds) regardless of how much effort students had put in or how much they had achieved of the particular lesson content taught.

The students' textbook was the mainstreamed classes' homework book and, because I was teaching part time, their classrooms were the nastiest re-locatable buildings on the campus. The students' self-esteem was very low, they had poor motivation and their expectations for their futures also were low. As their teacher, I felt that I too had low status but began to fight for their right to be treated in a more compassionate and inclusive manner and to advocate for better learning and teaching conditions for us. I have achieved some small gains but the reality of teaching a low ability mathematics class in 2003 indicates that there is still a long way to go to achieve the perfect learning environment for students with mathematical learning difficulties.

The reality of a low ability mathematics classroom in a secondary school in 2003.

My experience with students in the lowest ability mathematics classes have resulted in some dismal observations. Generally, the students are disorganised,

have poor reading and/or writing skills, have achieved less than 25% on their entry test, suffer maths anxiety or are even downright terrified. They elicit disruptive and task avoidance behaviours and are largely resigned to being continuously at the bottom of the heap. Truancy is prevalent, as is the appearance and disappearance of students who move in and out of school zones. Even though these students are considered to be in the lowest ability class, there is still a wide range of abilities and understanding and some students still need simple extension material to help overcome boredom.

Textbooks are often the oldest and most decrepit, with missing pages, which are often designed simply to teach and assess key skills rather than mathematical processes and are usually set only at Secondary level with no lower curriculum levels included. The classroom itself is restricted in layout, furniture and colour due to the constraints of timetable and finances and the only really useful resources are those produced by the teachers themselves.

Anecdotal evidence suggests that the classroom teacher is not always a person who wants to work with these students. If teachers are untrained in working with these students, or lack knowledge about their needs, they may become resentful of the extreme demands on their time and energy that is a constant in low ability classes; students can be quick to pick up on this and react to it. Furthermore, the New Zealand school system is results orientated and students are expected to get through the curriculum come what may; nor are there any independent learning schemes for individuals. It is my contention that anyone who struggles with mathematics, for whatever reason, has general mathematical Learning Difficulties and that these difficulties need to be addressed through intervention, using useful and empowering resources and specialised textbooks.

My reason for selecting this research topic is to investigate the standpoint on ability grouping within New Zealand schools, to discover some of the advantages and disadvantages of ability grouping and to determine the experiences of teachers working with low ability students. This research has risen from my passion for, and defence of, the students at the lower end of the

learning spectrum and I believe sincerely in teaching these students within their ability group. However, during the past three decades, much research has come out of the United States of America, which concludes that very few students, at any ability level, achieve better as a result of being taught with their ability peers. This dichotomy between the research findings and my own beliefs has prompted me to investigate the New Zealand experiences with ability grouping and particularly the experiences of those students in the lowest ability teaching groups.

If students' learning is holding them back from what is perceived as the expected, or normal, progression through school, my position is, that incorporating those students into mixed ability classes may minimise their learning potential, and may lower their self-esteem and/or their motivation. Whereas, grouping them together for teaching purposes will allow them to engage productively with the learning and allow them, possibly, to come to enjoy their mathematics classes.

1.2 Choice of Method, Data Collection and Analysis.

I chose survey by questionnaire as my research method as I was motivated by the need to collect data from many different sources (Anderson & Arsenault, 1998). This research is an exploratory case study in that I am inquiring into what is happening (Bouma, 2000) in a moment of time, rather than what is happening to relationships within a single case or entity.

Survey by questionnaire is an excellent method of eliciting personal opinion. At the outset, I was prepared to travel to conduct personal interviews and gave every participating Head of Department the option of being interviewed by me or of self-completing the questionnaire. This was the reason I limited my sample to schools that are within a two hour drive of my home. In the event, no teacher chose to be interviewed and I could have spread my net more widely throughout

New Zealand in the hope of gaining a more accurate picture of ability grouping experiences and opinions.

I have developed my questionnaire by incorporating a mix of quantitative and qualitative response questions. Firstly because some hard data is necessary for the analysis and secondly because I was keen to know how other New Zealand mathematics teachers feel about ability grouping in general, and their lowest ability students in particular.

1.3 Research Objectives

This study emerges from my deep commitment to students with mathematical learning difficulties and also from my curiosity to discover what those students' current experiences with mathematical learning difficulties might be in other New Zealand schools.

The primary objectives have been to ascertain firstly how much ability grouping occurs in New Zealand schools, and secondly to gain a snapshot view of what is happening to students with mathematical learning difficulties in 2003. Lesser objectives include the examination of how students are selected for groups and by whom, how the students are assessed, and who teaches them. This baseline data would enable further New Zealand research to be undertaken in order to learn more about the education of students with mathematical learning difficulties in the hope that these students' understanding of, and achievement in, mathematics could be improved.

1.4 Ability Grouping – Definitions of Terms for This Study

Notwithstanding that any group of students, however they have been selected or organised are, to some degree, mixed with regard to ability (Reid, Clumes-Ross, Goacher, & Vile, 1981), if a school has made any attempt to group

together students who are perceived to be matched by ability, this research considers those groups to be homogeneous in composition.

For this research, the term ability grouping was intended to cover all possible groups of students brought together, for mathematics teaching, by perceptions of ability. These groupings include streaming, or tracking, of a whole class for all core subjects, banding of a class for mathematics only, removal of some students for specialist mathematics teaching away from the rest of the class, and within class grouping to allow students of similar mathematical ability to work together in their normal classroom.

1.5 Students with Learning Difficulties

Students with severe, specific learning difficulties are generally provided for by Individual Education Programmes (I.E.P.s), special learning units and/or specialist help from Teacher Aides. The students who finally arrive in schools' mainstreamed, lowest ability groups tend to have long-standing, miscellaneous Learning Difficulties (LD) to a mild degree and may be suffering from severe maths anxiety after years of failure.

Miller and Mercer (1997) have summarised the problems that contribute to LD students' mathematical failures. These include attention deficits, memory problems, visual-spatial, auditory and information processing difficulties and motor disabilities. The authors observe that language disabilities and reading difficulties pose particular problems for the understanding of mathematics. In summarising the more negative aspects of students with LD, Montague (1996) observes common themes, which include poor academic self-concept, low expectations of future academic performance and attribution of failure to low ability. In addition, social difficulties and low self-esteem are common. Montague also summarised three descriptive studies investigating student perceptions of mathematical problem solving. The studies concluded that low achieving students have a poor attitude towards mathematics, low perceptions

of their own mathematical ability, saw problems as being more difficult than they actually were and were more impulsive and less positive than higher achievers.

In the United States, Learning Difficulties is claimed to be the largest field of Special Education and one which is rapidly growing (Torgesen, 1998). Renick and Harter (1989) maintain that social comparison processes play an important role in students' perceptions of their academic competence; that when comparing themselves with their learning disabled peers, learning disabled students' academic self-perceptions appear to be higher than when comparing themselves with normally achieving students in regular classes.

These students are also likely to have poor reading skills which further exacerbates mathematical Learning Difficulties (Hanich, Jordan, Kaplan, & Dick, 2001). Furthermore, the recent curriculum emphases on assessing meaningful investigations, problem solving and mathematical reasoning (Mastropieri, Scruggs, & Chung, 1998) to the detriment of key skills has also affected students with Learning Difficulties in mathematics. These students are the ones who rely on algorithms and key skills as life belts to keep their heads above the treacherous waters of Secondary school mathematics. The current emphasis on having to learn skills other than basic ones can be devastating for those students with limited ability who tend to have particular weaknesses in the area of deductive reasoning.

1.6 Definitions of Learning Difficulties

Learning Difficulties (LD), also known as Learning Disabilities, are not easy to define, precisely because there are many levels and intensities of difficulties with learning, which vary from student to student. However, just because LD are difficult to define and identify, does not mean they are not real (Keogh, 1988). Kavale and Forness (2000) comment on the obscurity of LD definitions which, they conclude, gave little insight into the nature of a student's condition.

Kibby and Hynd (2001) simply define students with LD as those who have difficulty learning, after excluding factors such as inadequate instruction and environmental or other disabling conditions. In other words, those students for whom there appears to be no good reason for not learning. Those students who are continually frustrated in their learning (Bender, 2002), those with memory, language and communication deficits or with deficiencies in problem solving processes and strategies (Montague, 1996) and those who fail to achieve expected learning tasks after sufficient teaching, are all showing clear indications of a learning problem (Keogh, 1988).

Zigmond, Jenkins, Fuchs, Deno, Fuchs, Baker, Jenkins and Couthino (1995) use behaviour symptoms to identify students with LD. These include hyperactivity, distractibility and perceptual problems. Chapman (1992) neatly sums up the definition problem by referring to LD in terms of *teaching* modifications which removes responsibility for LD from students and makes educational establishments firmly accountable for modifying their teaching to match the needs of all students.

For the purposes of this investigation, any student in a low ability mathematics group is considered to demonstrate Learning Difficulties. There may be a need to define some *specific* difficulties such as visual problems or hearing loss and these would need to be provided for accordingly. However, the rest of the group can be assumed merely to need as much help as it is possible to give, aimed at an appropriate developmental level for each student and in the most anxiety-reducing atmosphere possible.

1.7 Inclusion of Students with Learning Difficulties

There appears to be a genuine desire by governments to do their best to meet the learning needs of all students. In the United States, the government proposes to include all children in regular school settings on the strength of the No Child Left Behind (NCLB) Act of 2001 (NCTM Advisory Committee, 2003).

As far as New Zealand is concerned, Davies and Prangnell (1999) observe that up until the 1960s, children with special needs were all excluded from state education. However, since then, an increasing number of these children have been educated in ordinary, non-special schools, firstly, located in special, on-site classrooms, and latterly in mainstreamed classrooms. Full inclusion into New Zealand's state education system was achieved at the beginning of 1999, although the actual right to do so was provided for ten years earlier by Section 8 of the 1989 Education Act. All students with special educational needs generate a *formula-based, age appropriate level of resourcing* (my italics) (Davies & Prangnell, 1999). However, the level of resourcing targets age levels, rather than the students' *developmental* level of needs.

Davies and Prangnall emphasise that it is a school's responsibility to improve its organisation and environment to meet all educational needs and to include all students in the total school package. However, the lack of government recognition of LD children and the unattainability of remedial resources for them (Chapman, 1992) has led to their unfunded presence in all state schools. Their perceived lack of ability is then generally provided for by a school's grouping practices, probably the only possible practice open to a school, when no extra funding or resources comes with LD students.

The New Zealand government, however, states that it is committed to an inclusive education system that will provide learning opportunities of equal quality to all students (Ministry of Education, 1996).

> *It is a principle of the New Zealand Curriculum Framework that all students should be enabled to achieve personal standards of excellence and that all students have a right to the opportunity to achieve to the maximum of their potential. It is axiomatic in this curriculum statement that mathematics is for all students, regardless of ability, background, gender or ethnicity.*
>
> *Students of lower ability need to have the opportunity to experience a range of mathematics which is appropriate to their age level, interests and capabilities.*
> (Ministry of Education, 1992, p. 12)

This Ministry statement is quite clear that the intention in New Zealand is to teach all students at an appropriate level in order to allow them to achieve to their personal potential. This researcher maintains that this statement authorises and supports ability grouping in New Zealand schools.

1.8 Chapter Overview

Chapter 2 will review the literature on the employment and effects of ability grouping, how ability grouping research comparisons and interpretations are made, self-esteem and motivation.

In Chapter 3, this study's research design will be discussed. The process of designing the survey and questionnaire will be described.

Chapters 4 and 5 will report on the results of the study. Chapter 4 will deal with the detailed results of the survey and Chapter 5 will discuss those results and reach some conclusions about the findings. Implications for students with mathematical Learning Difficulties in New Zealand will be discussed and suggestions for further research will be made.

Chapter 2

Literature Review

2.1 Learning Theory

According to Mayer (1992), during the twentieth century, views on learning went from 'Learning as Response Acquisition' (rewards and punishments) through 'Learning as Knowledge Acquisition' (information dispensed by teachers and received by students), to 'Learning as Knowledge Construction' (students as constructors of their own knowledge – autonomous, self-starting learners with metacognitive skills). Thus, educational and classroom practice has moved from an emphasis on the *outcomes* of learning, towards the *process* of learning – its constructive and self-regulatory nature (Glaser, 1991).

'Knowledge Construction' and 'Prior Knowledge', terms found in recent learning theories, have informed government decisions regarding educational curricula. In current curriculum documents, certain skills are emphasised, such as self-management, communication and problem-solving skills, while statements stress the desirability of students becoming innovative and flexible (Ministry of Education, 1992). However, learning as a process of knowledge construction does present some difficulties to the achievement of national educational aims (Resnick, 1989) because many students either do not have the prior knowledge on which to build, or their prior knowledge has generated fear or boredom.

Vygotsky's 'Zone of Proximal Development' is concerned with the knowledge and skills students can learn with help. It is based on the theory of the usefulness of 'prior knowledge' to the learning of new knowledge. The notion of readiness for learning depends on accumulated prior knowledge (Good & Brophy, 1995). The expectation that LD students will have useful prior knowledge is probably unrealistic, especially as that prior knowledge may have led to fear, when little learning will occur.

Many current theorists are advocating that students experience a form of apprenticeship by exposure to 'situated learning' (Lave & Wenger, 1991; Pressley & McCormick, 1995) where students are actively involved in learning by watching their teachers and each other. Working together, this community of learners would assist in the development of mathematical knowledge. The mathematical knowledge would have involved all students in its creation, as well as giving all the students new opportunities for the richer understanding of mathematics (Bana & Walshaw, 2003). This community of learners relies on participation, communication, debate and negotiation for the production of mathematical meaning (Anthony & Walshaw, 2002), a phenomenon that LD students find particularly difficult to deal with.

In Chapter 1, it was noted that students with Learning Difficulties rely on mathematical algorithms and key skill knowledge in order to achieve some measure of mathematical success. These students are rarely self-starters or self-regulatory learners and prefer to *acquire* knowledge rather than to construct, or initiate it for themselves; nor do they cope well with conflicts of ideas. Even though there are some mathematical processes that LD students need to learn, such as simple problem solving skills, for these students there is much to be said in favour of the more traditional learning theories that predate 'Constructive Learning', 'Situated Learning' or 'Prior Knowledge'.

Piaget's 'Stage Theory' regarded the development of cognition as sequential, not necessarily with age-dependent norms but with maturation viewed as a determinant of moving through the stages. In other words, children learn when they are ready. Skinner's 'Classical Conditioning Theory' concerned stimuli eliciting responses, which can then be caused to diminish or flourish by the type of response elicited. For example, mathematics learning can lead to fear, failure, anxiety, success or boredom merely by students' experiences of stimuli and responses. The two views can be used to illustrate why some students are not ready for age-dependent learning (stage theory) or why some students find it impossible to learn because of subject fear (classical conditioning).

Bandura's 'Social Learning Theory' (observational learning) asserts that much can be learned from observing others' learning processes. This theory supports homogeneous groupings, inasmuch as it is not good for students' self-esteem to make upward, detrimental comparisons, as they would while observing others in a *hetero*geneous class (Reuman, 1989). However, it *is* good for students to watch a peer cope with a task while observing others in a *homo*geneous class (Allan, 1991; Renick & Harter, 1989).

2.2 Ability Grouping

In 1999, Arnove and Zimmerman compared the grouping issues of seven different countries (the United States, Japan, South Korea, France, Germany and Canada) and found some interesting differences and similarities. Asian countries appear to equate academic success with motivation and hard work while European and North American countries appear to equate it more with innate intelligence and individual difference. However, all the countries follow some form of grouping practice, whether it is covert – on party lines in China and academic screening for school entry in Canada, or overt as in France (where retention of students, common in the first grade, results in less need for retention in higher grades) and Germany (where less than 40% of students are placed in the academic tracks in high school).

Individual, human differences are inevitable (Keogh, 1988) and schools have to deal with those differences on a daily basis. Grouping in schools is profuse and varied and includes musical ensembles, choirs and athletic teams, as well as the more commonly viewed groups of low, medium and high ability students (Simpson, 1999). Simpson maintains that the only grouping controversy is about ability grouping and tracking and also quotes John Dewey's answer to the question of why students are grouped. According to John Dewey, grouping meets the academic and social needs of individuals. It is a response to those needs, through ability grouping and tracking, that has generated controversy.

Farmer (1996) identifies the two extremes of the debate about ability grouping. Those against the practice claim that, from school enrolment onwards, students are labelled, leading to predetermination of their educational future. Those in favour claim that heterogeneous teaching denies special education to those in need of it because of the premise that all students should receive the same education. Those who believe that ability grouping is not a constructive practice claim that students labelled low ability are unlikely to ever climb out of that educational level. Those in favour of ability grouping point out the dangers of denying special programmes to low ability students merely on the grounds that it might be politically correct, or that it might comply with current theory, to offer the same education to all students at the same time and pace.

Arnove and Zimmerman (1999) have catalogued a comprehensive list of grouping types common in all schools:

- mixed ability grouping which includes in class enrichment, co-operative learning and individualised instruction
- homogeneous ability grouping which includes specialised schools, specialised classes within schools, pull-out programmes and grouping for field trips and visits
- acceleration or retention which includes grade skipping, early admission to advanced levels, rapid progress and repeating a grade.

Even in situations of mixed ability grouping, the practice of homogeneous ability grouping is acknowledged by, for example, enrichment and co-operative learning. In Primary schools, the two most common variants of same ability grouping are homogeneous groups of students formed between-class, where classes are formed of students with similar ability, and within-class, where small groups of similar ability students are taught in an individual class (Hollifield, 1987). Hersberger (1995) maintains that within-class, mixed ability, co-operative group learning should be classified as homogeneous, rather than heterogeneous and Burnett (1995) classifies within-class grouping as an

alternative to ability grouping rather than a description of homogeneous grouping.

Tracking (also called streaming or banding) is a commonly used practice wherein students are separated for all academic subjects (Gamoran, 1992) and which has sometimes been taken to extremes in secondary schools by the development of 'homerooms' where a group of students stay in the same room for all their learning. Homerooms have declined in popularity recently due to perceived problems of stereotyping (Frampton (1982). The author observes that, academically, there is no difference for low ability students in a homeroom rather than in a regular class; however, socially, students in a homeroom are worse off because they are segregated with others who are, relatively, socially immature so have little opportunities for sharing better social behaviour with their more socially mature peers.

Whether a school's grouping system is called tracking, streaming, banding or ability grouping is immaterial to any discussion in this study and for the purposes of continuity and clarity, all such grouping practices will be referred to as ability grouping.

Advantages and disadvantages of ability grouping

> *Given poor instruction, neither heterogeneous not homogeneous grouping can be effective; with excellent instruction, either may succeed.* (Gamoran, 1992, p. 11)

Dreeben (1984) claims that grouping can be used well or badly, because negative consequences arise, not from the existence of grouping per se, but from how groups are treated. Dreeben maintains that grouping should be neither praised nor condemned for the learning or social consequence of it.

As grouping practices affect varied levels of ability from learning disabled to extremely gifted, the *effects* of the practices are also varied. Some of these

effects concern performance and some concern affect. Grouping may affect students' achievement expectations, students' need to make comparisons with their peers' achievements, students' actual achievements and students' attitudes towards school and learning.

As far as mathematics is concerned, Oakes, Ormseth, Bell and Camp (1990) demonstrated there was no doubt that ethnic minorities and lower SES students had been subjected to educational inequalities in the United States by being placed in low streamed classes. Their mathematics experiences had been conspicuously different from those of other students, insofar as they have had less contact with highly qualified teachers, less demanding programmes, different curriculum emphases and lower teacher expectations. However, in an earlier study, Sørensen and Hallinan (1984) found no evidence of race being used as a criterion for assignment to ability groups.

It is well documented that students have different learning needs and those differences tend to influence achievement. Herrington and Wolff (1985) found that one of the disadvantages in a mixed ability class is that high achievers given extension work do not get enough teacher attention. Reuman (1989) found that even though within-class grouping can decrease low-achievers' expectations and mathematics results, it can also *increase* their tendencies to make detrimental, upward comparisons of self. Other researchers, on the other hand, have observed that within-class, homogeneous grouping was advantageous to mathematical achievement (Bulgar & Tarlow, 1999; Hersberger, 1995). Allan (1991) suggests that students actually gain more from watching someone of similar ability deal with a mathematics problem rather than watching the calculations of someone who has already mastered the problem, as they would in a mixed ability classroom.

Advantages of ability grouping are voiced, in the main, by those teachers who are in favour of the practice. These advantages include teachers' beliefs that ability grouping increases students' learning, because it challenges the top groups and aids the lower groups (Spear, 1994), that the academic progress of all students is aided by segregation according to ability (Kerkhoff, 1986) and

that students in the lower groups benefit from working at a slower pace (Zevenbergen, 2001). Sørensen and Hallinan (1984) note that within-class groupings keep students on task, allow teachers to give individual attention to more students and allow teachers to work with small homogeneous groups for ease of preparation and material used.

However, it is not only the teachers who see the positives in ability grouping. For example, researchers have found that students think they learn more in a small, narrow-ability, group environment than they do in large heterogeneous classes (Lou, Abrami, & Spence, 2000) and that within-class homogeneous grouping appears to encourage all the students in the group to participate in developing mathematical solutions (Bulgar & Tarlow, 1999). Leonard (2001) suggests that group cohesiveness, rather than composition, appears to influence the amount and quality of student interactions within any group.

Kulik and Kulik's (1982) meta-analysis of the grouping issue noted that the benefits from grouping were small but significant with the highest effects among the students with the highest ability. They found that grouped students had more positive attitudes towards learning than did students in ungrouped classes and these positive gains were attributed to the specialised curriculum and the materials used.

In order to give their students meaningful classroom experiences, schools which group their students by ability are likely to tailor their resources to the ability level of the class. For example, low achieving students tend to be in smaller classes (Betts & Shkolnik, 2000). Tailoring teaching to students' needs also allows the schools to work with resources and texts that are personally challenging and stimulating (Gregory & Chapman, 2002) and not difficult or overwhelming.

Undoubtedly, there are disadvantages in ability grouping. For example, Zevenbergen (2001) notes that the ethos and behaviour management issues in lower streams act as significant barriers to learning, In addition, Rosenbaum (1984) found that students at the extremes of groups are in a vulnerable

position since they are in danger of being misplaced. One of the more serious problems with ability grouping, concerns an equity issue and involves differentiation on the grounds of race, gender and socio-economic status (SES) (Hallam, 2002; Hallinan & Sørensen, 1987; Lee & Bryk, 1988; Loveless, 1999; Matthews, 1995; Mills, 1997; St. George, 1983; Troyna, 1992). Other disadvantages have been noted. These include: poor exchange of mathematical ideas, poor peer interaction and fewer opportunities for mathematical thinking (Good, Reys, Grouws, & Mulryan, 1990); some evidence that middle groups are harmed by the practice (Betts & Shkolnik, 2000); the disparity between teacher quality, often with the least qualified and least experienced teachers, teaching the lowest groups (Zevenbergen, 2001); limited access to good mathematics programmes and academic opportunities for the lowest groups (Davenport, 1993) and the possibility that the practice of ability grouping is driven, not by students' ability, but by students' previous school performance which is, in itself, related to inequalities outside school (Gamoran, 1992).

Good and Marshall (1984) confine the ability debate to issues concerning developmental level, quality of instruction and peer support. They challenge the common definitions of homogeneous and heterogeneous classes, maintaining that what may be heterogeneous in one school could very well be homogeneous in another, depending on students' background. The authors cite studies showing that teachers behave differently towards low and high ability classes and low and high groups within a class, with lower expectations and standards noted in the lower ability classes alongside a slower pace and students' academic needs not being met. This argument is reinforced by Zevenbergen (2001) who observed a different quality of experience between upper and lower streamed students with reference to teaching, learning and assessment.

However, there is still strong support for ability grouping among both teachers and students. Robertson, Cowell and Olson (1998) report on a case study of integration and destreaming in Ontario, implemented in 1995. They note that one of the government's reasons given for destreaming at year 9 was that, in

the past, placement had been made on the recommendations of students' year 8 teacher. This was, at the time, viewed as disadvantageous to students in lower streams due to bias on gender, SES and cultural grounds. In conjunction with the proposed integration of the mathematics, science and technology curricula, destreaming was assessed by teachers as being difficult and overwhelming to put into practice. The students at the two extremes of the ability spectrum became frustrated, for different reasons, by the pace of each class. However, in effect, streaming still occurred in these classes because some students were working on key skills while others were able to be extended. The timing of units meant that all students were tested on the same day regardless of whether or not they were ready and high ability students were critical of the experience – they felt unchallenged by it. Students viewed a destreamed year 9 classroom as an extension of elementary school. In 1998, three years later, the Ontario government announced that ability streaming would be re-introduced in year 9 and upwards at two levels – academic and applied.

Grouping processes and practices

In New Zealand Secondary schools, ability grouping tends to be across core curriculum areas - grouped classes tend to stay together for Mathematics, Science, English and Social Studies. In the United Kingdom (UK), ability grouping is termed setting and tends to be grouping based on performance within separate curriculum areas (Davidson, 2001). This means that students are likely to be working with different groups for each lesson. However, from personal experience, this researcher has noted that students who struggle in one curriculum area are very likely to struggle in all core areas so that students will, nevertheless, probably see at least some of the same peers in each core class.

In England and Wales, group placement in secondary schools is influenced by factors other than ability; teacher judgement is also used (Ireson, Clark, & Hallam, 2002). Ireson and colleagues observe that several different types of

assessment are used but that social factors, such as friendships, were also taken into consideration, as well as balancing gender numbers. Movement between groups is not common in the UK and few systematic records are kept on set allocation or movement (Ireson et al., 2002).

Schools in the United States once commonly used IQ tests to differentiate students but, these days, tend to place students into tracks by prior achievement and teacher recommendation (Loveless, 1999). Resh (1998) notes that in Israel, tracking placement decisions are affected by more than ability and academic performance; Socio Economic Status (SES), ethnicity and gender play a part as well, with placement decisions also being made by negotiation between school, student and parents. Also, in Israel, guidance counsellors act as gate-keepers to guide students onto 'sensible and suitable' track choices. After setting, there is very little movement between tracks and higher tracks are limited in numbers (Resh & Erhard, 2002).

In New Zealand, the actual process of choosing which students will enter which group is fairly simple. Primary schools tend to use observations and indications from previous teachers (Wilkinson & Townsend, 2000) while Secondary schools are more likely to group according to results of Progressive Achievement Tests (PAT) or similar. In addition, within-class groupings tend to be put together as a result of teacher observation and professional decision making as well as observations from students' previous teachers (Wilkinson & Townsend, 2000). New Zealand practices will be explored more thoroughly in chapter 4.

2.3 Effects of Grouping Decisions on Students with Learning Difficulties

According to Crockett & Kauffman (1998), increasingly, children with LD are being educated in mainstream classes. However, Zigmund and colleagues (1995) argue that it is important to remember that those children consequently appear in special needs resource rooms because the regular classroom

environment has failed them. The authors discuss the American history of delivery systems to LD students and question the decisions that have been made. One conclusion made about the three main American projects aimed at improving LD students' achievements was that not enough of those students educated in a regular classroom made meaningful gains in reading achievement. During a five year, longitudinal study, it was revealed that the likelihood of failure increased relative to the length of time those students spent in general classes (Miller & Mercer, 1997).

Crockett and Kauffman (1998) remark that educational decision makers hold expectations about the results of integrating LD students into regular classes. These expectations include, that the students will interact with other students outside the classroom, that schools will have appropriate resources such as support staff and adapted technology and that students, somehow, will magically achieve at the same level as the rest of the class.

However, in inclusive classrooms, students with LD receive more negative feedback and less academic questioning than other students in the class and there may be little accommodation made for their needs because of schools' desires for them to be treated exactly the same as other students (Bulgren & Carta, 1992). Reuman (1989) found that within-class ability grouping lowers the expectations and mathematics grades of low achievers and increases their tendency to make upward comparisons to their own detriment. In an inclusive situation, LD students' learning is continuously frustrated by the difficulty of assignments. Bender (2002) maintains that the students also face ridicule from their peers and are often the victims of bias and hostility.

Miller and Mercer (1997) contend that in a mixed ability class, a teacher's decision to move on with the curriculum can have devastating results for students with LD. The authors go on to point out that mathematics is learned by building new skills onto previously learned skills (prior knowledge) and those students who are moved on through the curriculum without understanding the foundation skills, will experience further failure.

Scruggs and Mastropieri (1995) examined the consequences of inclusion programmes for LD students in mainstreamed classrooms. They concluded that resource rooms and other special education settings can provide better learning opportunities than do inclusion programmes. These better learning opportunities are, for example, specially designed curricula, specialised teaching methods, specially trained teachers and facilitative settings. They cited two unpublished doctoral theses (Centra, 1990; Rudenga, 1992) which conclude that students themselves favoured being in a resource room rather than being included in a regular classroom. The authors assert that alleged fears of the stigmatising effects of visiting a resource room may have been exaggerated by those educators against the practice.

In Jenkins and Heinen's (1989) study, both LD and non LD primary school children were questioned about their preference between being taught in a special, pull-out resource room, or in a within-class group with specialist support staff or integrated into a regular classroom with help from a teacher-aide. The authors report that when a clear alternative was offered to students, more preferred to be taught in a special pull-out resource room, with more older than younger students preferring this option. The perception was of less embarrassment, and more help received. A major reason behind the children's choice was embarrassment, with *all* three delivery systems causing embarrassment to some degree. More students preferred to receive help from their classroom teacher, rather than a specialist. The main reason given referred to how well the teacher knows and understands the needs of each child. However, the authors conclude that it probably has more to do with children not wanting attention drawn to their skill deficits.

Because LD students have special needs which require special teaching, teachers need to be able to create special learning environments to match those needs (Bottge, 2001). There is much evidence to suggest that this cannot be achieved by integrating LD students with higher achievers. Renick and Harter (1989) note that the formation of LD students' self-perceived academic competence is strongly influenced by social comparison processes. LD students can maintain higher perceptions of their own ability when they make

comparisons with their own LD peers in their resource room than when they make comparisons with normally achieving students in their regular classes.

Pierce (1994) studied a special classroom and concluded that in order to foster increased achievement and improved attitudes towards school and learning, LD students do well in a classroom where emotional needs are nurtured, where the possibility of failure is lessened and where students can feel safe and secure. The author noticed a reduction of inappropriate classroom behaviour, improved attendance and an increase in the number of completed assignments. The students claimed it was fun to learn in that classroom. Mercer and Miller (1992) noted also, that there are advantages in using special teaching programmes with LD students. However, Keogh (1988) doubts the effectiveness of using programmes if they have not been evaluated. Figlio and Page (2000) suggest that the presence of gifted and remedial programmes help to attract students from middle-income families to a school, which may indirectly benefit low ability students because the school then may increase expenditure and be able to retain teachers of higher quality – a case of an ever improving spiral.

Unless LD students are provided with appropriate curricula and instruction, supportive peers and teachers and good management of their educational environments, many educators fear a loss of equitable outcomes for them (Crockett & Kauffman, 1998). It is of concern that attempting to teach LD students in mixed ability classes does little for their academic self-perceptions or for equity considerations.

2.4 Self-esteem, motivation and maths anxiety.

Self-esteem (or self-concept), motivation and maths anxiety are important aspects of students' achievements in mathematics. Self-esteem is related to people's opinion of their own worth (Stipek, 1988), while students' academic self-concept is their perception about personal skills and abilities, after feedback from their teachers, parents and other students (Chapman, 1992).

Ireson, Hallam and Plewis (2000) found that grouping students for English classes, tended to lower the self-concept of the higher attaining students and to raise the self-concept of the lower attaining students. Students' self-perceptions are very reliant on factors such as academic successes or failures, social acceptance or rejection and teacher rewards and punishments; these factors also affect self-esteem (Wong & Watkins, 2001). There is a high correlation and reciprocity between academic self-esteem and achievement. Wong and Watkins' study of students in Hong Kong concluded that poor self-perception equates with low self-esteem, that the greatest negative impact on self-esteem came from within-class comparisons of performance and that students from lower streams, within a school, tended to have high self-esteem because they only have similarly low ability peers with whom to compare themselves. Presumably, placing these particular low ability students in a mixed ability class would be devastating to their self-esteem.

Motivation is an inner drive that causes people to take action; it also directs and energises behaviour (Borkowski, Carr, Rellinger, & Pressley, 1990) and, after repeated failure, lack of motivation is at the heart of most learning difficulties (Chapman, 1992). Academic motivation is linked with students' personal achievement expectations and is easily undermined. However, high self-esteem is motivating – previous success leads to high self-esteem which motivates students to repeat the experience (Pressley & McCormick, 1995).

Stipek (1988) maintains that achievement anxiety is often created by people's own perceived lack of competence and can interfere with learning and undermine achievement. Stipek also suggests that anxiety can be aroused when people's self-esteem is threatened. Maths anxiety, linked with avoidance behaviours and disruptive strategies, are all results of students' negative attitudes developed towards mathematics over a long time (Dossel, 1993). Dossel suggests that maths anxiety and poor achievement are both caused by another factor entirely – possibly the student's learning environment – and also summarises a number of factors leading to the creation of maths anxiety. These include the effects of public failure, competitive classrooms and students' own perceptions about the causes of difficulties with mathematics.

In a study of attitudes towards mathematics in an American Junior High School, Brassell, Petry and Brooks (1980) observed that mathematics achievement is linked to self-esteem and maths anxiety, with the lowest ranked students, in each level, being the most anxious. In two separate meta-analyses, Ma (1999) found a significant correlation between maths anxiety and mathematics achievement which was consistent across gender, age and ethnicity, while Ma and Kishor (1997) found a low, but significant, relationship between attitude towards mathematics and achievement in mathematics. The relationship appears to increase with age.

The main purpose of ability grouping should be to allow students to work with resources which are personally challenging and stimulating (Gregory & Chapman, 2002) which is possibly why Kulik and Kulik, (1982) found that ability grouping generally had positive effects on self-concept and attitude. Results of a study by Ma (1997) indicates strong links between mathematics achievement and every attitudinal measure used – three attitudinal measures used in each of three mathematics learning areas. Ma claims that mathematics achievement is affected by students' perception, not of difficulty, but of enjoyment.

2.5 Truancy and Underachievement

> *Attendance at school certainly does not guarantee academic success, but chronic unexcused absence virtually assures failure* (Kauffman, 1997, p. 385)

The quote from Kauffman sums up the common view that truancy is the cause of underachievement. However, Fergusson, Lynskey and Horwood (1996) question this traditional view of truancy as a cause of academic failure and suggest that truancy appears to be influenced by family functioning. Family functioning and truancy, taken together, would appear to be linked to underachievement. The authors note that truants generally do not display

common behaviour patterns but are, instead, variously influenced by family, schools as social institutions and students' own personal directions.

However, Lamdin (1996) noted a significant and positive correlation between school attendance and PAT scores while Rayner and Riding (1996) observed that a particular learning style – holistic rather than analytic – is associated with truancy. As an analytic learning style is usually associated with academic achievement, it is possible that learning styles is another link in the complex pattern of truancy. Prashnig (1998) maintains that allowing students to learn using their own, preferred, individual learning style will result in happier and higher achieving students. Kauffman (1997) suggests that reducing truancy may be achieved by offering students learning programmes which would hold their interest and meet their needs. The author also suggests, among other items, raising students' self-esteem and reducing academic demands. All of these recommendations could be accomplished by students learning at the appropriate developmental level, that is, by ability grouping.

2.6 Student Mobility and Underachievement

> *Stability in family, residence, school and school attendance support better learning. Those who need stability the most ... appear to have the least.* (Fowler-Finn, 2001, p. 36)

Research, both in New Zealand and overseas, has observed that many children who are highly mobile and attend many different schools during one year, are adversely affected by their lack of stable learning.

Large numbers of students in the United States change schools frequently and mobility appears to be higher among minority ethnic groups and low SES families (Rumberger & Larson, 1998). The authors further note that students' mobility affects mathematics achievement and their chances of graduating successfully from high school. At least half of the achievement differences

between mobile and stable students appear to be related to mobility effects rather than any effects that may predate school changes. Mobile students consistently achieve lower grades than stable students.

Mantzicopoulos and Knutson (2000) noted that, in the US, frequent changes of school before the third grade correlated strongly with underachievement. In addition, Heinlein and Shinn (2000) found that mobility prior to the third grade was a more powerful gauge of achievement three years later than was later mobility. This is supported by Pianta and Early (2001), who observed the disquieting statistic that, on average, 26% of classroom membership in American kindergartens changed during a school year.

Highly mobile children are more at risk of repeating a school year, of having inferior reading scores or of leaving school before graduating (Temple & Reynolds, 1999). These students were also more likely to register lower school achievement before moving and to have poor school adjustment and unsatisfactory behaviour patterns. The result of Temple and Reynold's study provides evidence that, as the number of moves increases, reading and mathematics achievement declines.

That same conclusion is borne out in New Zealand. In a study of student mobility in primary school children, Neighbour (2000) found consistently lower achievement in both reading and mathematics, throughout New Zealand, for students with high mobility. School roll turnovers in excess of 30% are common as are unacceptable social behaviours. More importantly for this study, transient students are more likely to have special learning needs. Interestingly, transience and roll turnover decreases as decile rating increases. Neighbour noted that in California and the United Kingdom, the incidence of mobility can be much higher than in New Zealand; and in the United Kingdom, high student mobility is strongly correlated with social deprivation. Common themes from New Zealand schools in Neighbour's study include:

- mobile children require extra learning support and resources,
- mobile children are generally behind their peers academically,

- mobile children often do not function well at school,
- mobile children had low self-esteem and poor social skills,
- mobile children are often placed in low groups with little chance to change,
- transience impacts on instructional continuity.

One category of highly mobile students, however, appears to go against the trend (Strobino & Salvaterra, 2000). These are the adolescent children of American military personnel who do not seem to be affected by changing schools, but manage to maintain average, to above average, academic grades, even in public (state) schools. Extracurricular activities, supportive school cultures and sound parental involvement were seen to be the main factors that provided some stability during times of school changes. Similarly, Plucker and Yecke (1999) found that military mobility had no adverse academic impact on the gifted children in their study. It is therefore possible that mobility is less of a factor in underachievement than are school cultures and parental involvement in students' lives.

Wright (1999) observed that students who moved either within, or across, school districts, had achievement affected. However, mobility was of less significance than ethnic minority status or family income. Wright further states emphatically, that underachievement actually often *precedes* mobility rather than following it. Educationally, however, there are significant differences between the mathematical achievements of the members of high and low mobility groups but, most especially, the differences are within certain SES groups (Blane, 1985).

2.7 Research Interpretations

The push to teach groups of same-age students in heterogeneous, mixed ability classes has come from the United States where much research has concluded that students taught in homogeneous classes learn less, and less successfully,

than their same-age peers taught in heterogeneous classes. More recently, other researchers have questioned some of the interpretations made from those earlier results as well as some of the definitions used.

Strong censure was presented by Rosenbaum (1984) of what he called the model of a "single United States Educational System" which had produced such powerful, yet conflicting, research conclusions concerning the results of ability grouping. Those results indicate about equal numbers of positive and negative effects. Biemiller (1993) criticised the definition of 'success' as describing all students performing at the same level at the same age. He asks what is wrong with students' diversity in achievement? Kulik (1991) disapproves of researchers' lack of distinction between types of grouping programmes which tend to differ in extent of curricular adjustment and in effect. Lytton and Pyryt (1998) observed that social class variations explained up to 45% of the variation in achievement tests, with the minimum effects coming from student characteristics, school-based variables and class size.

Standardised Achievement Tests (SAT), from the US, are criticised (Allan, 1991; Kulik, 1991), firstly because it is very difficult to see any improvement for gifted and/or high achieving students as they always achieve near to the ultimate score anyway, secondly because SATs tend to give weaker results compared with those from studies that use local tests and lastly because the tests rarely evaluate what is actually being taught in classrooms. Allan's (1991) examination of two major reviews of ability grouping research criticised the conclusions reached. She found that few allowances were made for the type of standardised tests used, which were not sensitive enough to discern grouping effects. She argued that programmes were not assessed for effectiveness and neither were the materials used, nor the programmes themselves, taken into account.

Figlio and Page (2000) question the traditional method of comparing students taught in tracked and untracked schools, which results only in a variation across *school* type. The authors advocate using variation in *student* types which would demonstrate that there is little evidence of low ability children being harmed by

tracking. They also maintain that the current popular trend of detracking of schools in the US may actually result in harm being done to disadvantaged students rather than improving outcomes for them.

Meanwhile, Hallinan (1990) points out that studies which compare mean achievement scores reveal nothing about score distribution in the comparison classes. Hallinan notes that mean scores can remain unchanged after a change in spread of scores and criticises those studies that fail to account for variations in instructional processes or curriculum differences in the comparison classes, which she sees as fundamental to differences between classes. Lack of good classroom observations (Boaler, Wiliam, & Brown, 2000; Good & Marshall, 1984) has also been censured, along with the high use of quantitative research methods without the benefit of classroom observations.

Fuglini and Eccles (1995) observe that some researchers report positive outcomes to ability grouping and some report negative outcomes. They suggest that one reason for the discrepancy is that different comparisons have been made, as some studies compare ability grouped students with students in mixed ability classes while others compare high ability with low ability classes. The authors note that there is a scarcity of comparative research between grouped and non-grouped students at similar ability levels. They note too that there is also a lack of longitudinal research on ability grouping, resulting in sparse evidence for long-term effects of grouping.

Similarly, Betts and Shkolnik (2000) question evidence that grouping has large differential effects in Secondary schools because high and low grouped students have previously been compared with *average*, ungrouped students rather than with students of similar ability. Furthermore, Loveless (1999) remarks that many of the past meta-analyses that point to negative conclusions about tracking, involved different tracking systems than are commonly in place today. Finally, Kulik (1991) deplores the extensive "blanket condemnation of grouping" and worries that children will be the losers if researchers continue to misconstrue their findings.

2.8 Conclusion

As educational theories have changed, so too have school and pedagogical practices changed. No longer are students expected to soak up information in order for it to be regurgitated on command, but are now expected to create their own knowledge and communicate it to others. In order to cope with these changing practices and improve students' learning, many schools practise some form of ability grouping and even students themselves believe that they learn more in a homogeneous, small class environment. More positive attitudes towards learning, specialised curricula and tailored resources are just some of the advantages accruing from ability grouping. Allowing students to work at their individual, developmental level can best be achieved by some sort of grouping, either within-class or between classes and those grouping decisions need to be made by schools themselves, who are armed with local knowledge about the community in general and their students in particular.

Grouping processes tend to be dependent on observations plus recommendations from a previous year's teacher as well as testing students on school entry. New Zealand appears to take a particularly egalitarian attitude towards the process. Other countries' schools tend to take a more dictatorial part in the process, which is possibly why much of the negative research about ability grouping has come from overseas.

It is of some concern that researchers report that many students in the US, from ethnic minorities and low socio-economic groups in particular, have been placed erroneously into low ability classes and that many students in those classes have experienced poor teaching and less demanding work. However, the many advantages of ability grouping would appear to outweigh the disadvantages.

Researchers report that students with LD have benefited from ability groups, as so many with severe LD have been mainstreamed by government edict. Their negative experiences in inclusive classrooms, contrasts considerably with their positive experiences in ability grouped classrooms where they are exposed to special, nurturing, learning environments, and where they can feel safe from

embarrassment. Their attitudes towards school, attendance and learning all improve in an ability grouped classroom.

Students' self-esteem and motivation are improved by being placed in an ability grouped class and their anxiety towards schoolwork is consequently lessened. Maths anxiety and mathematics achievement are consistently linked across gender, age and ethnicity and maths anxiety is also linked to low self-esteem and poor motivation.

It would appear that student mobility and truancy, both of which were suggested as contributing markedly to students underachievement, do not appear to be closely linked. There is now strong evidence that the underachievement actually predates the mobility and/or truancy and that family life and school cultures may be more important factors in the problem. It is possible that offering special learning programmes (i.e. in a specialised learning group) may hold truants' interest and meet their needs. However, there is no doubt that increasing school mobility is of growing concern in New Zealand as mobile students become a great drain on schools' resources.

Finally, this researcher is concerned about some of the research interpretations made in the past, which have led to negative claims about ability grouping. The apparent demand in America for all students to be performing at the same level and at the same age has been questioned by those who support diversity in achievement. The lack of clear distinction between grouping programmes has also been questioned, as has the use of Standardised Achievement Tests. Criticism has been made of conclusions reached in some reports and the lack of account taken of programmes, and materials used in schools. There has been some question of who or what is actually being compared in studies and also how the statistical results have been calculated. Lack of good classroom observation has also been censured as has the infrequent use of qualitative research methods.

The extreme complexities of dealing with students' varied achievement levels need to be addressed in the light of many factors. This study attempts to

investigate part of that complexity and to reach some elementary conclusions. The study has been designed in order to minimise the amount of quantitative data and maximise the qualitative.

Chapter 3
Research Design

3.1 Introduction

The basic premise of this research was a perceived need to establish New Zealand schools' experiences with mathematical ability grouping in light of the often overwhelming research results, from overseas, demonstrating that ability grouping is an overvalued concept. New Zealand research into the practice of ability grouping has been meagre and it was therefore considered timely to conduct this study.

The decision to construct the questionnaire as a mixture of qualitative and quantitative methods arose from two concerns: first, the desire to allow teachers' voices to be heard, and second, to produce rigorous, quantifiable information for the New Zealand experience. The difference between qualitative and quantitative research is one of appropriateness, rather than right or wrong (Bouma, 2000). Accordingly, this research has endeavoured to close the gap between the, often perceived, two extremes by quantifying continuum-scaled responses and carefully noting teachers' personal responses for qualitative interpretation.

Steps were taken to ensure that all relevant ethical considerations were adhered to. At the same time, further steps were taken to ensure that internal and content validity would be guaranteed. Since there has been no intent to generalise or to extrapolate the results to include all New Zealand schools, the issue of external validity has not arisen. The limitations of any research (Anderson & Arsenault, 1998; Bouma, 2000; Burns, 1997; Cohen & Manion, 1994) need to be addressed. In this chapter, I acknowledge the limitations of this research, the questionnaire, the sampling methods and the attempts made to overcome any problems that arose in the collection and analysis of data.

3.2 Data Collection Methods

Sampling

Using the 'Te Kete Ipurangi' website at http://www.tki.org.nz, seventeen districts within the Auckland, Waikato and Bay of Plenty regions were chosen. Those regions, for convenience, were within a two hour drive of the researcher's home.

On the website, all schools are listed alphabetically, within each district. However, the districts were kept in the same indiscriminate order in which they were printed from the website, in order to ensure as random a sampling of schools as possible.

The names of special schools were removed as they were not expected to yield any pertinent, effective data. The list was then separated into Secondary, Intermediate/Middle and Primary. The Primary schools were further separated into rolls less than 100 and rolls greater than or equal to 100 to ensure that the smaller schools would be included. As the final sample was intended to number approximately 80 schools, with Secondary : Intermediate : Primary in the ratio of 2 : 1 : 1, it was decided that about 120 schools would receive the initial information sheet and letter of request for support (Appendix A).

The schools were selected by systematic sampling and weighted to achieve an approximate ratio of 2 : 1 : 1 (secondary, intermediate/middle, primary). The final list contained 115 schools which included a wide ranging mix of co-educational, single-sex, Intermediate, Middle or Junior High, Contributing or Full Primary, state, private, various roll sizes and decile ratings from 1 – 10.

The Questionnaire

The survey is the most commonly used, descriptive research method in education (Burns, 1997). Cohen and Manion (1994) suggest that the postal

questionnaire is the best form of survey in an educational enquiry, especially when financial and resource constraints are important concerns. Unlike Burns, who claims poor returns on postal, self-completed questionnaires, Cohen and Manion argue that:

> *Response levels to postal surveys are not invariably less than those obtained by interview procedures; frequently they equal, and in some cases surpass, those achieved in interviews* (p. 96)

Posted questionnaires are easy to administer and, if well-constructed, allow for the quick and inexpensive compilation of reliable and moderately valid data (Anderson & Arsenault, 1998). It can be argued that self-completed questionnaires result in more trustworthy answers than interviews, as respondents may feel freer to be open and honest in their responses when not faced by the researcher asking the questions. However, there are a number of disadvantages in employing self-completed questionnaires. These include the danger of biased sampling through respondents' self-selection, the lack of follow-up for the purpose of correcting ambiguous responses and the absence of opportunity to check that respondents have interpreted questions according to the researcher's original objectives.

The descriptive survey (Burns, 1997) used in this research examines conditions at one point in time, taken from a representative sample. The questionnaire used (Appendix C) was designed to elicit both quantitative and qualitative data from the sample schools, with the objective of ascertaining and exploring teachers' and students' experiences with ability grouping in mathematics. There was some attempt made to explore the many reasons for students' apparent poor mathematical ability (as perceived by teachers) and those responses were quantified on a continuum. Methods of student group selection, group division and teaching programmes were also quantified. Respondents were encouraged to give their personal opinions about many statements and these have been collated and summarised by theme.

For the reasons stated before, only schools in a restricted area of New Zealand were surveyed. However, an effort was made to achieve a representative sample of most types of school by the weighting process (2 : 1 : 1) and also by the further separation of the Primary schools by roll size. A genuine effort was made to achieve a good response rate and that effort resulted in 74 questionnaires returned out of 210 postings. A rate of return such as this would suggest reasonably representative responses.

The questionnaire was multi-coloured in order to differentiate between headings (black), questions (red) and response choices (blue). The wording of questions was as simple and clear as possible. Good questionnaire design practice, as outlined by Anderson and Arsenault (1998) and by Cohen and Manion (1994), was followed. In particular, the questionnaire provided clear instructions, sufficient space for responses and plentiful use of tick boxes. All questionnaires were accompanied by stamped, addressed envelopes to encourage participation and the rate of return of responses was maximised with follow-up, reminder letters (Appendix D).

Responses

All sampled schools were sent an initial information sheet and letter of request for support. Only 45 schools, out of 115, replied to this request, so the remaining schools on the original list were sampled in the same way as before, yielding a further 96 schools. What this meant was that, despite the careful sampling techniques, *all* Secondary and two-thirds of Intermediate schools on the original list eventually received requests to participate. In total, the two postings (210 altogether) yielded 74 completed questionnaires.

Response rates to the questionnaire were maximised by including stamped, addressed envelopes in *every* posting, by sending follow-up, personalised letters and occasionally by personal contact.

3.3 Ethical Factors and Concerns

Because educational research is fundamentally about human beings who have personal values and beliefs and who make life choices and moral judgements, educational researchers need to conduct research within an ethical framework (Clark, 1997).

Therefore, a piece of research must satisfy a number of ethical considerations regardless of whether the research is quantitative or qualitative. Bouma (2000) gives a number of general recommendations to researchers:

- be thoughtful, sensitive and considerate of others' feelings; do not waste their time by being unpunctual or unprepared;
- when questions are to be asked, make them succinct and to the point;
- research should be carefully designed in order not to offend or embarrass participants;
- permission must be sought carefully, and expected outcomes not disclosed because of the danger of biased responses;
- use letters of introduction stating exactly who the researcher is, who is endorsing the researcher and how long participants are expected to be involved;
- include a complaints clause in the letter of introduction;
- place the well-being of participants above the researcher's 'need to know';
- protect participant's identity;
- participants' decision to take part in research must be voluntary and based on informed consent;
- participants must be free to withdraw at any stage during the research process

In conducting this research, the following steps were taken to ensure that all relevant ethical factors were adhered to:

- Approval was obtained from the Massey University College of Education Ethics Committee.

- Informed consent was given by all teachers with mathematical responsibilities. Initially, a consent form was returned that indicated whether the teachers wished to complete the questionnaire themselves or to have the questionnaire researcher administered. Secondly, an official consent form was signed by each teacher surveyed and returned with the questionnaire.
- All schools remained anonymous and only referred to in terms of roll size, decile raring and so forth.
- Only the researcher and supervisor had access to consent forms and completed questionnaires.

3.4 Validity, Reliability and Limitations

The questions of validity and reliability are not easy to address for qualitative research. Validity implies generalisability to other situations, while reliability is to do with the possibility of repeating the research with the same results obtained (Anderson & Arsenault, 1998; Merriam, 1998; Wiersma, 1995). More important than generalisability are the accuracy of interpretation and whether or not other researchers can understand the results (Wiersma, 1995) while Merriam (1998) maintains that traditionally understood reliability in qualitative research is unachievable because research which relies on human description and explanation cannot be replicated.

Validity

Validity is about the issue of whether or not what is chosen to be measured represents adequately the hypotheses and research questions proposed (Bouma, 2000), or even that it measures what it purports to measure (Burns, 1997). Internal validity reflects the truth of interpretation as well as the truthfulness of responses while external validity concerns the over-generalising of results (Anderson & Arsenault, 1998). The content validity of a questionnaire

is a measure of the extent to which the questions need to reflect the researcher's objectives (Burns, 1997).

This study has attempted to take a snapshot view of whether, how and why schools group their students by ability for mathematics teaching; the researcher's objectives have been reflected in the questions asked. Internal validity may have been affected by less than truthful responses, or the researcher's poor interpretation of the responses. There is no intention at this time, to generalise results to encompass all New Zealand schools.

Reliability

A piece of research can be reliable without being valid if it always produces the same erroneous results. If an obtained score is the same as it would have been two weeks before or two weeks after, it is deemed reliable (Burns, 1997) or if the same measurements are observed and recorded many times (Bouma, 2000). Bouma suggests that reliability can be improved by increased discipline and accuracy of research reporting. Reliability also refers to the same conclusions being drawn by different researchers using the same measurements. For qualitative research, it is important to be aware that responses may not always be truthful and that slipshod questions will yield unreliable data (Anderson & Arsenault, 1998). Merriam (1998) suggests that, notwithstanding the need for reliable data, replications of qualitative research are not necessary to their reliability, as such replications will rarely yield the same results as the original.

Limitations

Limitations can be associated with both the researcher and the research itself. Bouma (2000) remarks on the importance, both of keeping conclusions commensurate with the questions asked and of noting any limitations concerning the sample used. Limitations must always be acknowledged. Also,

there is always a danger that the researcher will bring preconceived concepts and expectations to the research process Even though researchers may endeavour to resist their own values or motives contaminating the results, they are only human (Burns, 1997). There is also the danger of a researcher not interpreting results objectively (Anderson & Arsenault, 1998).

3.5 Limitations of this research

Limitations of this research

This research can only report on the responses of a small number of teachers and their perceptions about their students' need for, and participation in, groups sorted either by ability; or in mixed, heterogeneous class groups. This research cannot generalise to other schools in New Zealand; neither can it delve beyond the actual responses in an attempt to explore teachers' possible knowledge about the arguments for and against ability grouping. For example, it would be foolish to claim that schools persist in ability grouping *in spite of* the research recommending schools not to do so.

Limitations of the questionnaire

Self-completed questionnaires can lead to misunderstandings of terms and questions (Cohen & Manion, 1994) and this research did not escape that problem. There has been some ambiguity in responses and some misunderstandings of questions by respondents. For example, 'what is the school's rationale for grouping?' and 'what does the school consider to be the advantages in grouping by ability?' are, in fact, two distinct questions but were often treated as identical. One question asked how the validity of the selection assessment was itself assessed and offered an example of checking group placements by further assessments. Most replies were simply responses to the example. In retrospect, the question should have offered a list of possible validity checks from which to choose. Similarly, the question 'how is the

programme validity checked?' was misunderstood by the majority of respondents.

The use of Likert scales for 13 questions in the sections for ability grouped schools and 3 questions in the section for mixed grouped schools were employed to allow teachers to respond in the least possible time. The scale's use of 6 possible choices was designed to discourage half-way answers but some respondees did tick in between the possible choices. One matter that is of some concern is that the majority of responses were between the 'strongly agree' and 'tend to disagree' (1 – 4) portions of the scale, even though some of the statements were deliberately provocative, such as 'when grouped by ability, those students in the lowest groups appear to have high self-esteem' and 'are motivated to learn'. The concern is with how much thought teachers put into responses that just needed ticks in boxes -- that perhaps the attempt to reduce the time needed to complete the questionnaire may have also caused thinking time to be reduced.

Limitations in sampling

One of the primary limitations in this study stems from the decision to limit the sample to those schools within a two-hour drive of Hamilton. It was assumed, erroneously, that numbers of teachers would prefer to be personally interviewed by the researcher rather than complete the questionnaires themselves. In the event, only two schools requested an interview and, on receipt of the questionnaire for preview, decided to self-complete it instead. The sample would have been widened to include the whole of New Zealand if this had been anticipated beforehand.

The main problematic result is that this study's sample encompasses the largest proportion of New Zealand's population and the country's largest urban centre. This meant that there were no truly rural schools in this sample and consequently, the decision was made not to compare the responses of urban with rural schools.

Finally, the qualitative data has to be interpreted by a researcher making judgements on the basis of personal theories (Anderson & Arsenault, 1998) and this researcher was not immune to that trap. All responses were carefully noted and it is hoped that they were commented on without judgement. However, the researcher's enthusiasm for students with Learning Difficulties in mathematics is likely to affect some conclusions.

This research began with an assumption that about half of the schools responding would be grouping their students by ability for mathematics learning. This assumption proved to be incorrect, which meant that the expected comparisons between 'yes' and 'no' schools could not be made. Instead, comparisons are made between different *types* of schools (for example, decile ratings; Secondary, Intermediate and Primary and so on) which group their students by ability. The results of this study have proved to be occasionally startling and the opportunity to hear the voices of many teachers has been illuminating.

Chapter 4

Results

4.1 Sampling

Invitations to participate in the study were sent to a variety of schools. Using the Te Kete Ipurangi website at www.tki.org.nz, 210 initial letters in total were distributed to seventeen districts within the Auckland, Waikato and Bay of Plenty regions. These districts were chosen to be within a two hour drive of the researcher's home as all H.O.D.s of mathematics were given the option of being personally interviewed by the researcher. The names of special schools were removed from the list as they were not expected to yield any effective data.

It was hoped to receive approximately 80 responses of completed questionnaires. Of the 210 initial requests sent to H.O.D.s asking them to participate, 104 replies were received – a 49.5% response rate. 82 of those responses requested questionnaires and 74 completed questionnaires were eventually received – a pleasing 35.2% response rate from the initial posting.

Of the 74 completed questionnaires:

- 1 (a Primary) stated emphatically that there was no ability grouping in that school
- 2 (both year 1 – 15 schools) responded both yes and no (certain year levels were not grouped while others were)
- 2 responses were unidentifiable but both answered yes to ability grouping
- 69 schools (identifiable by school type, size of roll and decile rating) responded yes to ability grouping.

It was hoped, originally, that the ratio of Secondary : Intermediate : Primary would be 2 : 1 : 1. Unfortunately, the final ratio is difficult to establish since so many schools overlap in the year levels taught:

School Type	Year levels taught	Response
Conventional Secondary	9 – 15	23
Multi level	1 – 15	6
Conventional Intermediate	7 – 8	17
Contributing Primary	1 – 6	2
Full Primary	1 – 8	9
Intermediate plus Secondary	7 – 15	10
Part of a multi-level school	10 – 15	3
Middle	7 – 10	2
	TOTAL	72

Table 1: Sample response by school type

With a total of 72 usable responses, the ratio of conventional schools is 23 : 17 : 11, which approximates to 2 : 2 : 1 (Secondary : Intermediate : Primary).

Apart from the varied year levels, the sample contained a wide ranging mix of co-educational, single sex, state and private schools, various roll sizes and decile ratings from 1 – 10.

It is acknowledged that the sample is self-selecting, as are all voluntarily completed questionnaires (Burns, 1997).

4.2 The Likert Scale

Likert scales in questionnaires allow respondents to react to a statement, rather than answering a question. Regrettably, Likert scaled questionnaire items typically lead to skewed distribution curves. Anderson and Arsenault (1998) maintain that skewing is caused by the questionnaire containing too many items that most people 'strongly agree' with. The majority of the Likert scaled questions in this study have also resulted in distributions skewed towards

'strongly agree' even though some deliberately provocative statements were used in an effort to encourage some disagreement.

The scaled items generally complied with Anderson and Arsenault's (1998) extensive list of recommendations. Their list includes details such as avoiding lengthy, factual or ambiguous statements, using just single ideas in one statement and avoiding words such as all, always, none, never, just or merely. In addition, as Anderson and Arsenault recommend, the Likert scaled questions were gathered together rather than being scattered throughout the questionnaire.

An even number of possible responses, on the Likert scale, were deliberately chosen in the hope that no one would choose a middle response. However, a number of respondents ticked between the boxes and these were recorded as 2.5, 3.5 etc. and will appear on graphs as such, at in-between positions.

The questions required a response by choosing from: strongly agree, agree, tend to agree, tend to disagree, disagree and strongly disagree and, for the purposes of quantifying the responses, they were numbered 1 – 6 in the same order as above. Statistical means were then taken of all the responses, both collectively and also in the more specific divisions of Secondary, Intermediate and Primary schools, roll sizes and decile ratings. The raw data were then converted to percentages (correct to 1 decimal place) which allowed for more realistic comparisons to be made.

4.3 Collation of Responses

As questionnaires were received, they were scanned for 'yes' or 'no' replies to the first question "Are students in your school grouped by ability, in any way, for mathematics lessons?". Four tables were then used to collate the responses, two for 'yes' schools and two for 'no' schools. One table in each was reserved

for numerical and yes/no answers and the other for the longer explanations, personal opinions and extra details.

When all questionnaires had been returned, the longer responses were summarised by question number. The means of the numerical data were calculated and then converted to percentages. The percentages were then tabulated, firstly by question number and secondly by school type. The school type divisions were:

- All secondary
- Secondary rolls greater than 900
- Secondary rolls less than 900
- All Intermediate
- Intermediate rolls greater than 500
- Intermediate rolls less than 500
- All Primary
- Full Primary
- Contributing Primary
- Decile rating 8 – 10
- Decile rating 4 – 7
- Decile rating 1 – 3

Full Primary schools incorporate years 1 to 8 and tend to have smaller rolls than Contributing Primary schools which comprise years 1 to 6. The decile rating divisions are dispersed throughout all school types and levels. The 'All Secondary', 'All Intermediate' and 'All Primary' divisions are summary results of those particular school types.

Area schools and other multi-level schools not fitting the above divisions were placed in with the Secondary schools.

4.4 Schools' Rationales For or Against Grouping

Of the 72 usable responses, a surprising 71 acknowledged grouping by ability to some degree. Only 1 school teaches all students in heterogeneous classes. 69 of the schools favoured ability grouping for the majority of their students' mathematics classes.

There are some common themes in the responses amongst the schools who do favour ability grouping. Many schools mentioned needs-based grouping as well as catering to individual learning needs. Extension and acceleration opportunities are believed to be made easier, by grouping all high ability students together. In addition, the optimising of teacher effort and preparation time and the utilisation of the skills and strengths of teaching staff were common rationales. In addition, one Primary school responded that ability grouping:

> *Allows for greater flexibility in the organisation of mathematics programmes. It ensures all children can learn at an appropriate developmental level*

while another replied:

> *Improved staffing to pupil ratios then improves teaching and learning opportunities*

One Secondary school's response matches this researcher's observations of many teachers' beliefs about ability grouping:

> *Teaching can be geared to appropriate levels* [a single level approach to the curriculum]. *Students learn better and are more likely to achieve their potential*

There is a perceived reduction in workload stress and the opportunity for more focussed and in-depth teaching.

4.5 Schools' General Opinions about Grouping

Those aspects of ability grouping which schools consider to be advantageous

Schools' responses to the question about grouping *advantages* tended to repeat their responses to schools' rationales *for* grouping.

A summary of Primary and Intermediate schools' statements include: teaching to students' needs according to ability rather than age, ease of teacher planning, preparation and marking and the chance to use targeted, rationalised resources for cost-effectiveness

Students' perceived attitudes are mentioned:

> *Students are able to work more steadily through content, due to the similar level of teaching* (small, decile 7, Middle school)

A summation of the tenor of responses:

> *All students have the chance of success. The more able students are extended and not held back* (small, decile 7, Middle school)

Secondary schools perceived similar advantages. For example, teachers are able to focus on the approach and method considered most suitable for each level, with suitable presentation. Some comments were made to the effect that behavioural issues were easier to manage, which resulted in less disruptive behaviour and less stress in the classroom. Improved academic results – important to Secondary schools – are commented upon, as is improved success for those of lower ability.

Those aspects of ability grouping which schools consider to be disadvantageous

Schools in favour of ability grouping tend not to acknowledge many downsides in utilising the practice.

However, some practical disadvantages were suggested. For Primary schools, timetabling issues and the integration of students into other curriculum areas caused problems. Intermediate schools also remarked on timetabling restrictions when all students need to learn mathematics at the same time, leading to overstructuring. Also mentioned was the problem of the need to restrict class sizes, which can lead to some students being taught at an inappropriate ability level. This becomes evident when full classes are forced to exclude deserving students.

Practical issues do not appear to be a problem in Secondary schools, as mixed timetables are an integral part of Secondary school life. The issues were considered to be more about stereotyping, the building of 'ghetto' mentalities and students' morale. The risks of stereotyping are viewed as being a danger to both ends of the spectrum "nerd versus stupid", while the cultural ramifications to the lowest ability groups, which are, according to one respondent:

> *predominantly, or overpopulated by, Maori and Pacific Island boys* (a decile 3, average sized Secondary)

could be of concern. One of the concerns about the lowest ability classes is that the class may not create sufficient challenge or stimulation, a view shared by Intermediate schools. Another anxiety for the lowest groups, shared by Primary schools, was of the lack of mathematical dialogue between the members of the lowest groups and the more analytical and critical thinkers in the higher groups. This is coupled with the problem of there being fewer peer role models for the low ability students with whom to share time.

4.6 The Selection of Groups and Assessing the Validity of The Selection Process

The basis of group selection

The list of options offered were:

- PAT
- IQ test
- School's own test
- Other

By far the most common method of group selection was through the use of schools' own tests (40%), followed by Progressive Achievement Tests (22%). Primary schools also use the Ministry funded, Numeracy Project assessments, while both Primary and Intermediate schools have access to banks of assessment resources. Teacher observations and recommendations by previous teachers also play their part in group selection at all school levels.

Grouping decisions tend to be made by classroom teachers (for within-class grouping), by syndicate and team leaders in Primary and Intermediate schools and by Heads of Departments in Secondary schools. Deans of levels and Deputy Principals may also be involved in the process.

The validity of the selection process

It is possible that this question was misunderstood by a number of respondents, many of whom tended to comment on re-testing the students (the example offered with the question). The possible assumption made by schools, regarding such re-testing must be that if students stay in the same relative position after a re-test, the original assessment must have been valid.

However, the intent was for teachers to comment on how well-grounded they felt their assessments were and how that was examined. For example, how are

schools checking for possible cultural discrepancies or making allowances for the poor reading skills of a child who may possess exceptional mathematics skills?

4.7 The Division of Groups

Primary schools tend to group their students within a class, with occasional small groups withdrawn to resource rooms for specialised teaching. Intermediate schools appear to work with both within-class and between-class groupings. This includes absolute stratification of groups, as well as one top group separated, with the rest of the students in mixed ability classes (where within-class groupings would occur).

Secondary schools, on the whole, are inclined to practise between-class groupings across all core curriculum areas. Variations on this grouping include: lowest ability separated across all subjects with all other students separated for mathematics only, special classes for 'English as a Second or Other Language' students and the, fairly common, grouping practice of one top group and one bottom group with the rest mixed. One average sized, decile 6, Secondary school caters well for all their students:

> *A year 9 homeroom for limited students plus one top class at years 9 and 10. Within-class grouping is according to needs and remedial work is available through the learning centre*

Schools with large refugee populations also cater extensively for these students' particular needs.

4.8 Lowest Ability Groups

The teaching programmes used

The options offered were:

- Specially designed course
- A softened version of the National Curriculum
- Lower levels of the National Curriculum
- A mixture of above
- Other

The most typical response for Intermediate and Secondary schools was for "A Mixture" (41% of all schools). Primary schools, on the other hand, are more likely to use lower levels of the National Curriculum (40% of all Primary school responses). All three levels of schools use their own specially designed courses and Secondary schools are more likely than the other two to use a softened version of the National Curriculum. The use of the Correspondence school was also mentioned.

Checking the validity of the programme used

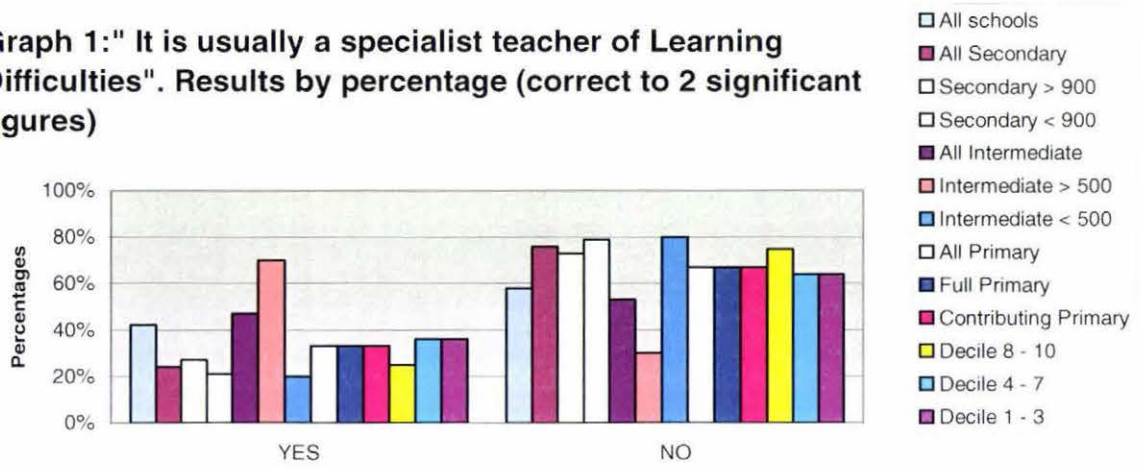
Teacher observations and professional judgements are commonly used, at all three school levels. However, there also appear to be some genuine efforts made to be more rigorous in the checking process. For example, one large, decile 5, Contributing Primary school requires a classroom teacher and teacher aide to write a report on programme validity, including data. Secondary schools often act on feedback from students because one measure of success for low ability students is their enjoyment, or otherwise, of their mathematics experiences. Many schools refer back to the Ministry Curriculum Document (Ministry of Education, 1992) for reassurance about their programmes. Staff and faculty discussion meetings are also deemed to be useful venues for checking on programmes.

The teachers who teach the lowest groups

This section was presented as four statements, each with yes/no options for answering. There was also a place for 'other' answers if the four options did not cover a school's particular circumstances. Not all of the questions were applicable to all schools.

'It is usually a specialist teacher of Learning Difficulties'

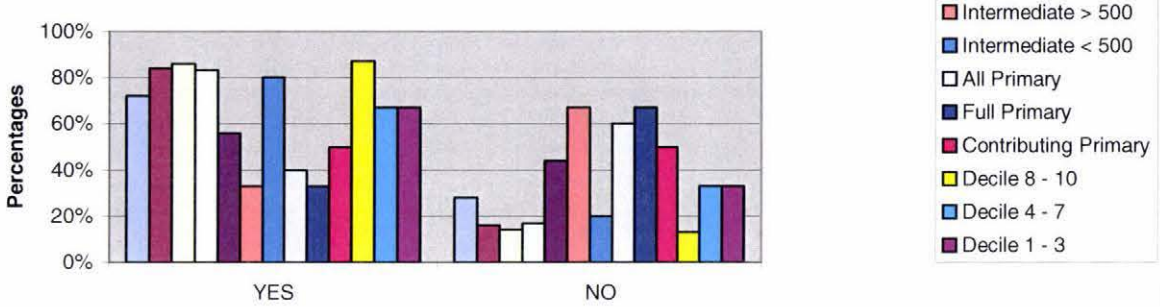
Graph 1:" It is usually a specialist teacher of Learning Difficulties". Results by percentage (correct to 2 significant figures)



42% of all respondents answered 'yes' to this question. However, this mean is at an artificially high level due to the huge 70% 'yes' response from large Intermediate schools. The rest of the respondents were more likely to respond 'no' than 'yes'. Taking those Intermediate schools out of the statistics, changes the 'yes' response to just 25%. This is likely to be the more realistic figure as it is quite uncommon for mathematics teachers to be trained in working with LD students.

'It is a teacher well-qualified in mathematics'

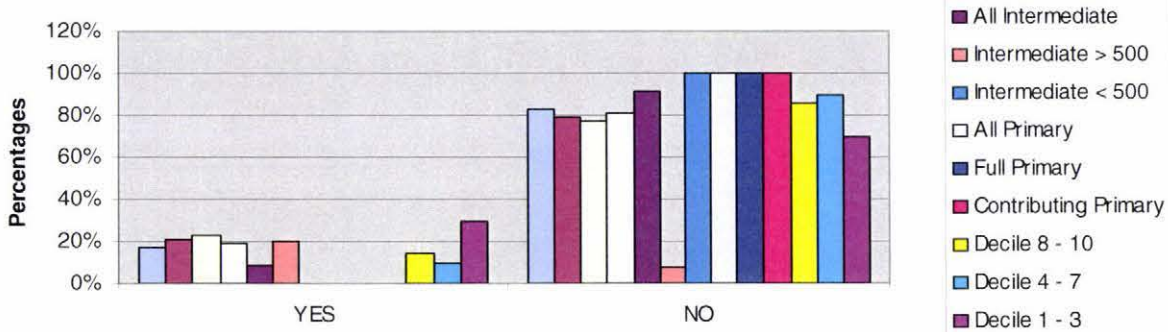
Graph 2: " It is a teacher well-qualified in mathematics". Results by percentage (correct to 2 significant figures)



72% of all respondents replied 'yes' to this question. Primary schools and smaller Intermediates are the least likely to employ well-qualified mathematics teachers for their low achieving students. This possibly reflects the more general nature of a Primary teacher's training.

'It is often a teacher brought in from another department'

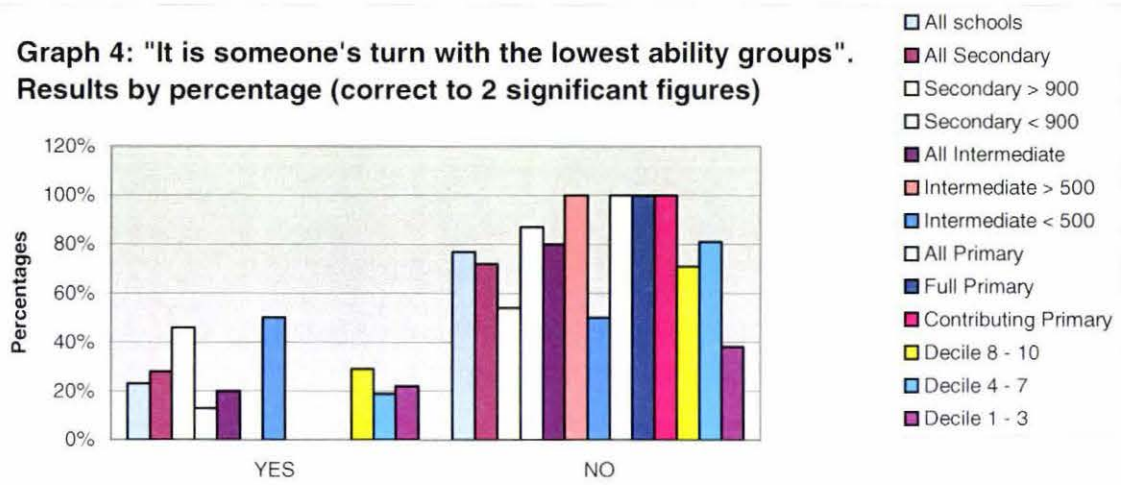
Graph 3:"It is often a teacher brought in from another department". Results by percentage (correct to 2 significant figures)



This question reflects what used to be a common situation in Secondary schools, where teachers with good mathematics skills are often found in other departments within a school. A pleasing mean response of 'no' (83%) is indicative of how the learning of LD students is being taken more seriously than it once was.

'It is someone's turn with the lowest ability groups'

Graph 4: "It is someone's turn with the lowest ability groups". Results by percentage (correct to 2 significant figures)



Only larger Secondary schools and smaller Intermediates are likely to require teachers to take turns with the teaching of lower ability classes (46% and 50% respectively). A mean of 77% of all respondents answered 'no' to this question indicates, once again, the possibility that LD students' learning is being viewed in earnest.

Those schools that commented on an 'other' option to the question of who teaches the lowest ability groups

For those schools that commented on an 'other' option (51%), LD students in Primary and Intermediate schools are commonly taught by their classroom

teacher with help from a Teacher Aide. One small, decile 5 Intermediate allows teachers to:

> *Elect to take the group they are most confident with*

A 30-pupil, Full Primary school employs a Teacher Aide who uses a specific programme monitored by the Principal, while one multi-level, private school has solved the problem by each classroom teacher taking a certain ability level and then receiving 2 – 3 pupils from other classes.

One Secondary school commented on how staffing decisions depended on the timetable and three Secondary schools mention that:

> *Everyone gets one low ability class*

while others specifically employ Primary trained teachers for the task.

How students' learning is assessed

Schools' responses to this question demonstrate, once again, that assessment is undertaken with rigour where LD students' learning is concerned. Pre and post unit tests are the most common responses from Primary and Intermediate schools, closely followed by teacher observations.

> *Students are checked against established learning outcomes at each level* (a large, decile 5 Intermediate)

and some teachers are expected to supply:

> *A daily book collection, a weekly review of student learning and monthly tables* (an 87-pupil, decile 3, Full Primary)

Some Intermediate schools use portfolio tasks and conferencing as well as some, more atypical, assessment measures such as:

Oral understanding, personal interviews and anecdotal evidence

mentioned by Primary and Intermediate schools.

Secondary schools, on the other hand tend to use common tests, topic tests and examinations with only a rare response referring to anecdotal evidence or activity type assessments.

Schools' opinions as to the best person to teach the students in the lowest ability group

The extensive variety of responses to this question is interesting. As a summary of a number of responses, the *ideal* teacher appears to be: Patient, motivated, mathematically qualified, knowledgeable, enthusiastic, a good planner, a practical hands-on person, familiar with learning styles, understands individual needs, experienced, a good manager, positive and passionate about teaching LD students.

Curiously, one large, decile 10, private Secondary school acknowledges that the best teacher need not be a mathematics academic – a response which mirrors this researcher's experience and conclusions made after conversations with a number of students.

Secondary schools tended to emphasise the need for a specialist in LD teaching and some saw Primary teachers as the ideal. A large, decile 8, Secondary school neatly summed up the requirements:

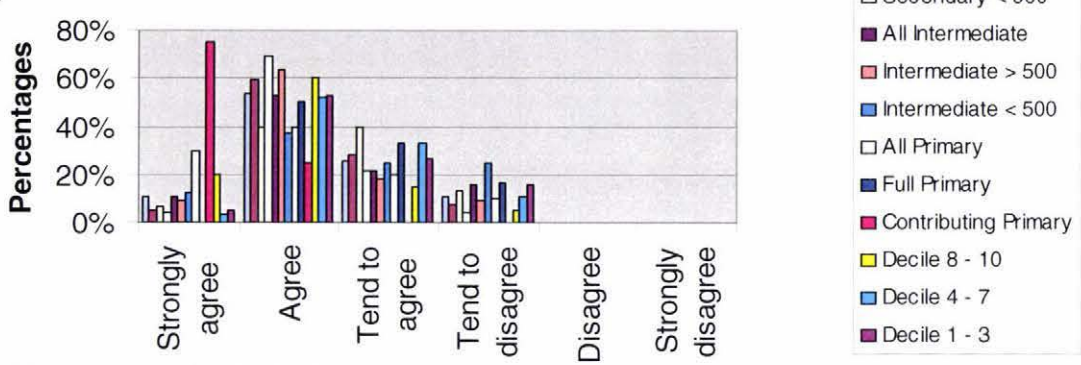
Someone trained in working with low ability students, with good control; structure and variety is needed

4.9 Self-Esteem and Motivation

This section reports on questions relating to students' self-esteem and motivation. Respondents were asked to indicate their level of agreement to a number of statements. Indications were made on a six point, Likert scale. Optional comments were also sought.

'When grouped by ability, those students in the lowest groups appear to be happy'

Graph 5: "When grouped by ability, those students in the lowest groups appear to be happy". Results by percentage (correct to 1d.p.)



Contributing Primary schools stated quite emphatically that they 'strongly agreed' (75%) with the statement. However, all other schools were more inclined to 'agree' or 'tended to agree'. No respondent 'disagreed' or 'strongly disagreed' with the statement. One average sized, decile 5 Intermediate school 'tended to disagree' with the statement and commented:

> *Depends how things are done. Always being in the lowest group is demoralising*

One small, decile 6 Intermediate school, that 'strongly agreed' stated:

> Often say they [the students] enjoy maths now and don't feel threatened by high achievers

Another Intermediate school, decile 9, with a high school roll, 'strongly agreed' and stated:

> [Students] *gradually become more confident; lessons progress from where they are at*

The larger Intermediate schools were more likely to 'agree' than the smaller.

The Secondary schools also 'agreed' (59%). Comments from Secondary schools included mention of students' lives outside school which were deemed to be:

> *Beyond the maths department's control* (a small, decile 10, private Secondary)

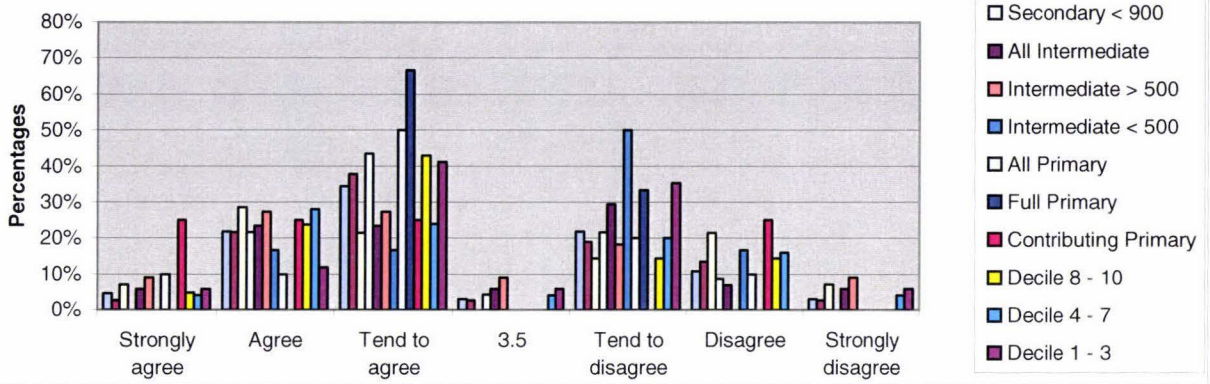
as well as the personalities of students and the class dynamics. One large, decile 10, single-sex, private school which chose 'tend to agree' remarked that the students:

> *Would not be much happier in mixed ability classes*

Other schools commented on students' needs being met, work rates that students could cope with, correct vocabulary levels and appropriate lesson content.

'When grouped by ability, those students in the lowest groups appear to have high self-esteem'

Graph 6: "When grouped by ability, those students in the lowest groups appear to have high self-esteem". Results by percentage (correct to 1d.p.)



Note: The 3.5 refers to those responses that were placed between 'tend to agree'(3) and 'tend to disagree'(4).

This statement engendered some responses between 'tending to agree' and 'tending to disagree', with most of those responses coming from large Intermediate, and decile 1 – 3, schools. The majority of other responses from all schools (56%) are from 'tend to agree' and 'tend to disagree' (that is, very much clustered in the centre), with an interesting number of responses coming from 'disagree' and 'strongly disagree'.

One large, decile 9 Intermediate school which 'strongly agreed' stated:

> *Initially hesitant but soon feel safe and enjoy participation*

One of the more average Secondary schools (decile 5, roll size 1000) maintains that:

> *Self-esteem is built in maths classes, as all other subjects are mixed, where they compare themselves with more able*

Large Secondary and large Intermediate schools were more inclined to 'disagree' and 'strongly disagree' than the younger age-level or smaller schools.

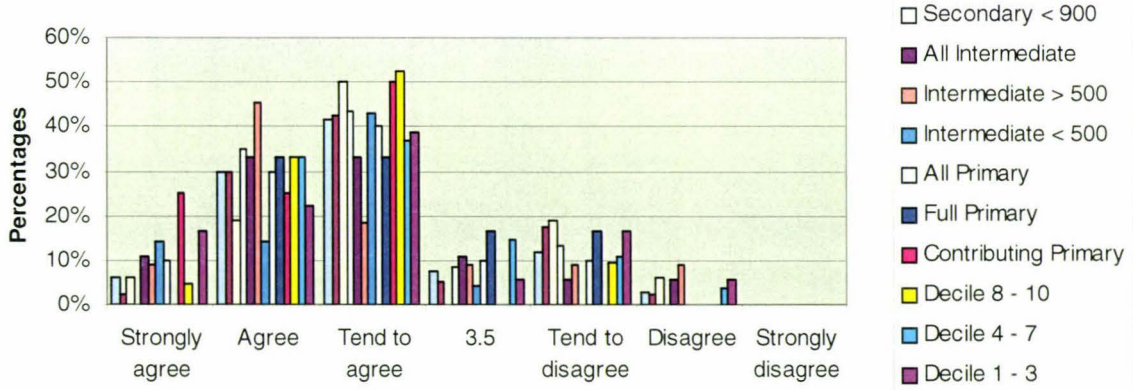
Problems outside school were commonly perceived to affect mathematics self-esteem and, for Secondary schools, the feeling of being at the end of a long history of student failure was commonly mentioned. One very large Secondary school chose 'disagree' but conceded that self-esteem could come from tasting success and if students are:

Comfortable with what they are learning

These last comments were also acknowledged by a large, decile 9 Secondary school which had chosen 'tend to disagree'.

'When grouped by ability, those students in the lowest groups are motivated to learn'

Graph 7: "When grouped by ability, those students in the lowest groups are motivated to learn". Results by percentage (correct to 1d.p.)



Note: The 3.5 refers to those responses that were placed between 'tend to agree'(3) and 'tend to disagree'(4).

This statement elicited the highest number of in-between responses, with those numbers increasing with decreasing school sizes and age-level. The majority of responses were for 'tend to agree', followed by 'agree'. One perception is that students' presence in a low ability group is really not due to any lack of actual mathematical ability:

> *Many are in the lowest group because of no motivation due to social baggage/home life that comes with them* (a large, decile 5 Contributing Primary school)

> *Are they ever motivated?* (a small, decile 4, state Secondary school that responded 'disagree').

However, many comments were more positive and optimistic:

> *More chance to enjoy success* (a very large, decile 5 Secondary school)

> [Students] *feel a sense of achievement and do not compare themselves with the top students* (a large, private, multi-level school)

> *Can be top in own group, therefore not bottom all the time* (a small, decile 2 Intermediate school that chose 'strongly agree).

A small, private, single-sex school summed up their students' motivation to learn:

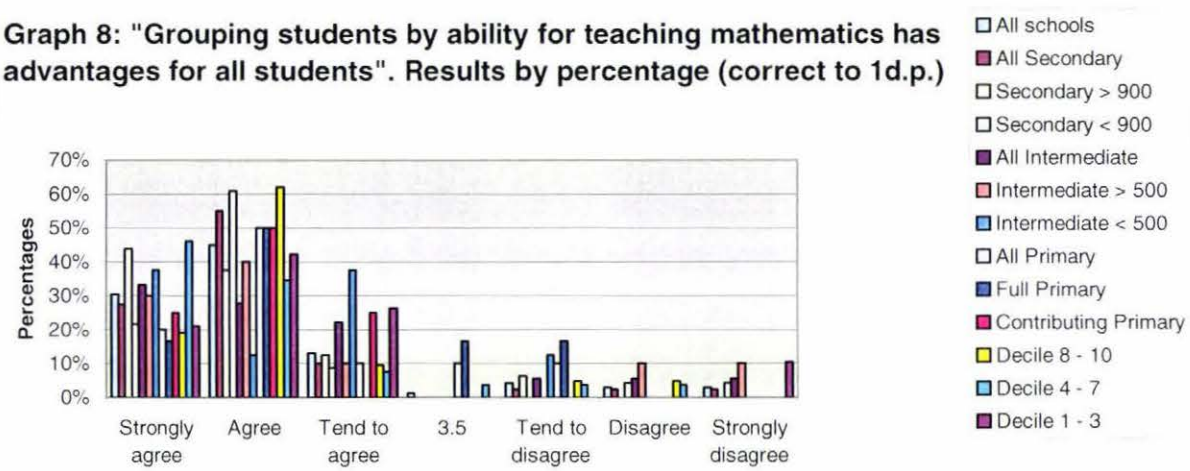
> *Depends on teacher, regular affirmation and properly co-ordinated classes and programmes of work*

4.10 Teachers' Opinions about the Experiences of Students in Ability Grouped Classes

This section reports on teachers' opinions about the experiences of students in ability grouped classes. Once again, respondents who had answered 'yes' to ability grouping were asked to indicate their level of agreement to statements, on a six-point, Likert scale. Optional comments were also sought.

'Grouping students by ability for teaching mathematics has advantages for all students'

Graph 8: "Grouping students by ability for teaching mathematics has advantages for all students". Results by percentage (correct to 1d.p.)



Note: The 3.5 refers to those responses that were placed between 'tend to agree'(3) and 'tend to disagree'(4).

The greatest level of response came from small Secondary and Decile 8 – 10 schools (60.9% and 61.9% respectively 'agreed') while a small, but significant, number of large Intermediate and Decile 1 – 3 schools (10% and 10.5% respectively) 'strongly disagreed'.

The comments about this statement tended to reflect those made earlier about the advantages of ability grouping:

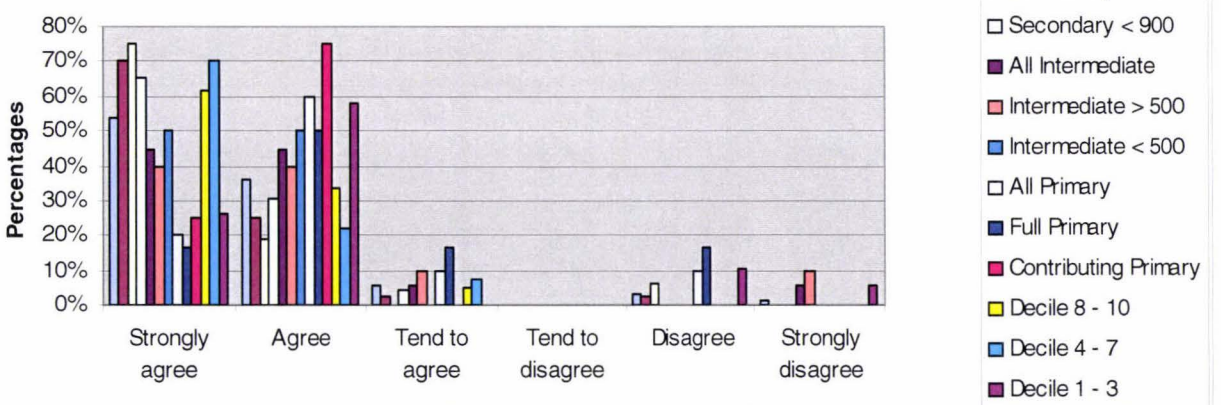
Top students get frustrated in mixed ability classes (a large, decile 5 Secondary school)

Easier to teach, more learning takes place (a small multi-level private school)

Have tried mixed ability teaching – huge time commitment and exhausted if trying to do the best by all students. Top students flourish [in an ability group] *being with like academic minds* (a large, decile 9 Secondary school).

'Grouping students by ability for teaching mathematics has advantages for students with high ability'

Graph 9: "Grouping students by ability for teaching mathematics has advantages for students with high ability". Results by percentage (correct to 1d.p.)



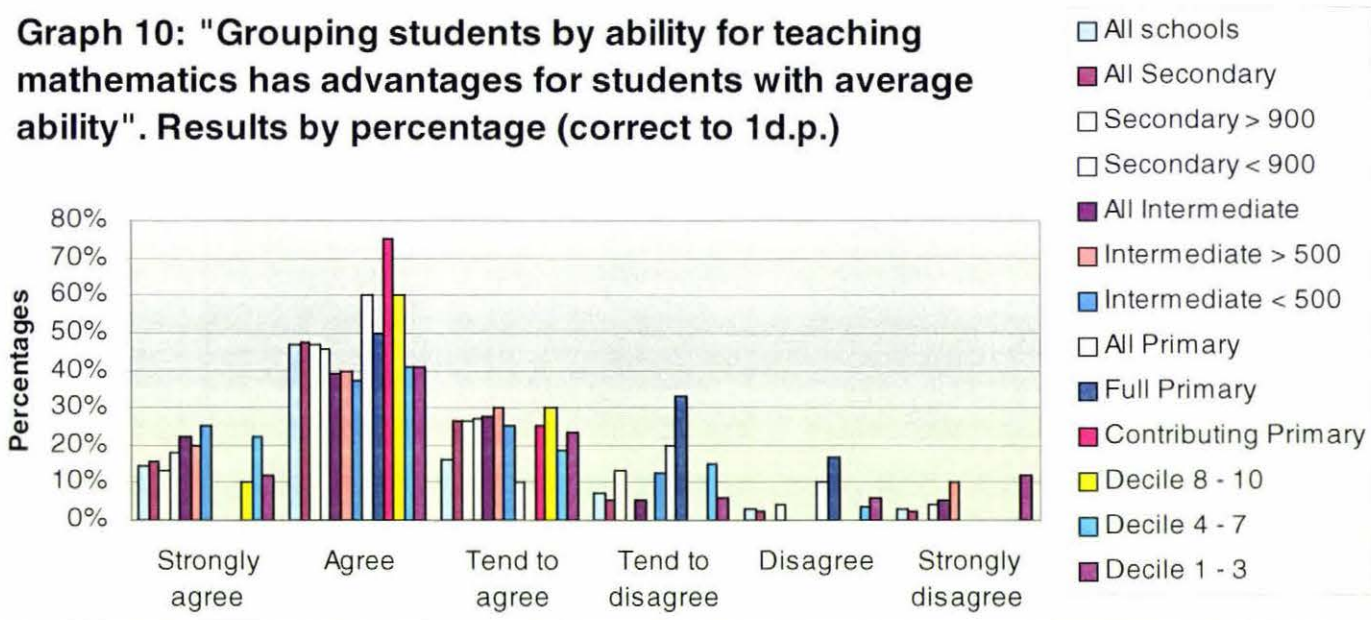
It is interesting to note that Secondary and Intermediate schools are more likely to 'strongly agree' with this statement, while Primary schools are more likely to 'agree'. In addition, a trend is noted in the decile ratings with the percentages tending to decrease with decreasing ratings. The more negative responses were most commonly apparent among the lower decile rated, Full Primary, small Secondary and large Intermediate schools.

Regrettably, the only comments came from those schools in agreement with the statement. Typically:

> *Students feed off each other and buzz when posed with challenges* (a large, decile 10 Intermediate)
>
> *Cover work quicker and have more challenging problems* (a very large, decile 10 Secondary)

'Grouping students by ability for teaching mathematics has advantages for students with average ability'

Graph 10: "Grouping students by ability for teaching mathematics has advantages for students with average ability". Results by percentage (correct to 1d.p.)



Contributing Primary schools were the most emphatically in agreement with this statement (75%) followed closely by Decile 8 – 10 schools (60%) and Full Primary schools (50%). However, the Full Primary schools were also clearly in disagreement with the statement and 10% of small Intermediate schools 'strongly disagreed'.

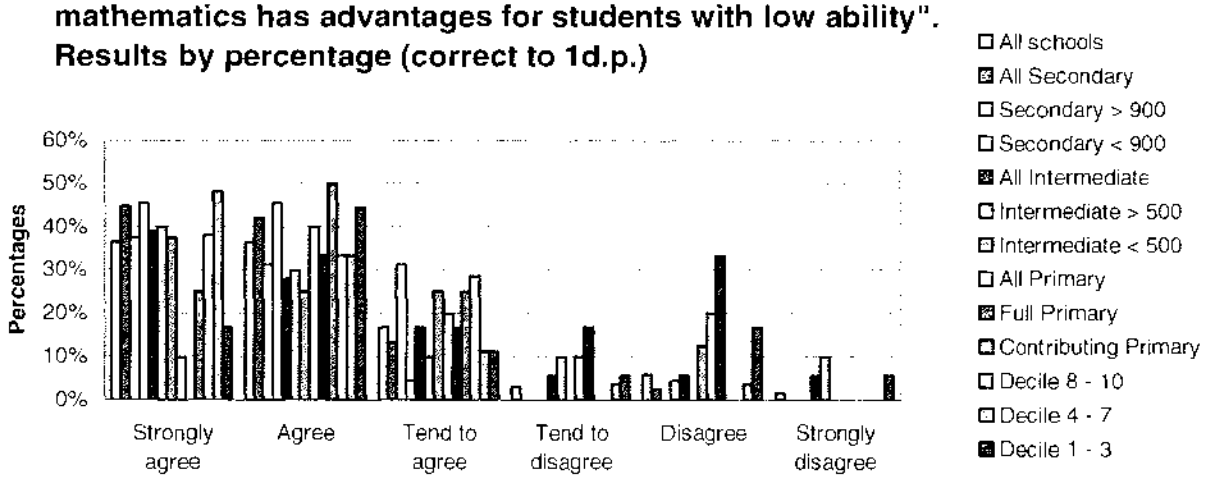
The dilemma of where to place students with average ability is not easy to solve as the following comments illustrate:

> *Sometimes an average ability can be stimulated by being in a challenging situation* (a small, decile 10 Full Primary school)
>
> *Not overshadowed by faster, more capable students* (a large, decile 9 Intermediate school)
>
> *Students* [sic] *working at a higher level in a class is often a motivational factor to many average students* (a small, decile 4 Intermediate school)
>
> *Not held up by lower ability students* (a very large, single-sex Secondary school)

All age levels of schools grapple with the quandary of student placement and, as is apparent from schools' comments, there is much diversity of opinion.

'Grouping students by ability for teaching mathematics has advantages for students with low ability'

Graph 11: "Grouping students by ability for teaching mathematics has advantages for students with low ability". Results by percentage (correct to 1d.p.)



A number of responses indicated 'tend to disagree' or 'disagree' with this statement (56% of Full Primary and 22% of Decile 1 – 3 schools in particular). However, the majority of responses were shared by 'strongly agree' and 'agree'. Nevertheless, some qualifiers to agreement were made:

> *Only where class numbers are lessened and students have more time* (a decile 9 Intermediate school)
>
> *Depends on how removed from the other groups these students are* (a decile 6, Intermediate school)
>
> *As long as self-esteem is preserved* (a large, decile 10 Intermediate school)
>
> *If they have a good, dedicated teacher* (a small, decile 7 Secondary school)
>
> *Provided numbers are limited* (a small, decile 5, private, single-sex school).

These qualifying comments are indicative of the need for schools to treat their low ability students with care – supplying small classes, good teaching programmes and teachers who are dedicated (in both senses of the word) to these students.

Other comments are more general but still indicate schools' awareness of students' needs:

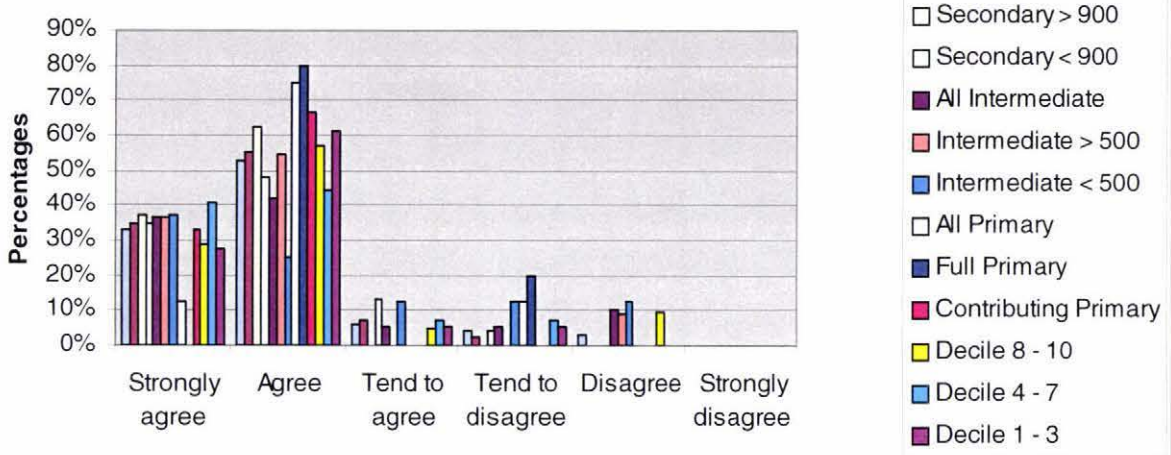
> [Students] *often need 100% teacher support, which cannot be given in a class with a wide variety of abilities* (a decile 4 Intermediate school)
>
> *They don't feel the pressure as much* (a decile 5 Intermediate school)

Smaller classes – more attention – more success at their level (a large, decile 5 Secondary school)

Students can move at a non-threatening pace (a small, decile 1 Secondary school)

'Low ability classes can be productive places of learning'

Graph 12: "Low ability classes can be productive places of learning". Results by percentage (correct to 1d.p.)



These responses are very definitely skewed towards agreement with the statement. 87.5% of all Primary, 78.9% of All Intermediate and 90% of all Secondary schools 'strongly agreed' or 'agreed'. The statement was deliberately worded to be provocative as anecdotal evidence suggests that many teachers regard low ability mathematics classes, less as places of learning, and more as places for "*vegie maths*", "*babysitting*", conflict and despair.

Agreement comments are varied and range across all decile ratings:

Students achieve success; more opportunities to seek help; can be competitive to reach top of group (a large, decile 9 Intermediate school strongly in agreement)

Less so as students get older (a small, decile 6 multi-level school)

Classes tend to be smaller so the teacher has more 1 to 1 contact, so individual student plans have more chance of being followed; use of Teacher Aides helps (a small, decile 1 Secondary school)

One small, decile 3 Secondary school that 'tended to disagree' responded:

[Students] *live up to expectations of being 'dumbo' – a self-fulfilling prophecy*

while a small, decile 4 Intermediate school perceived learning to be masked by another issue:

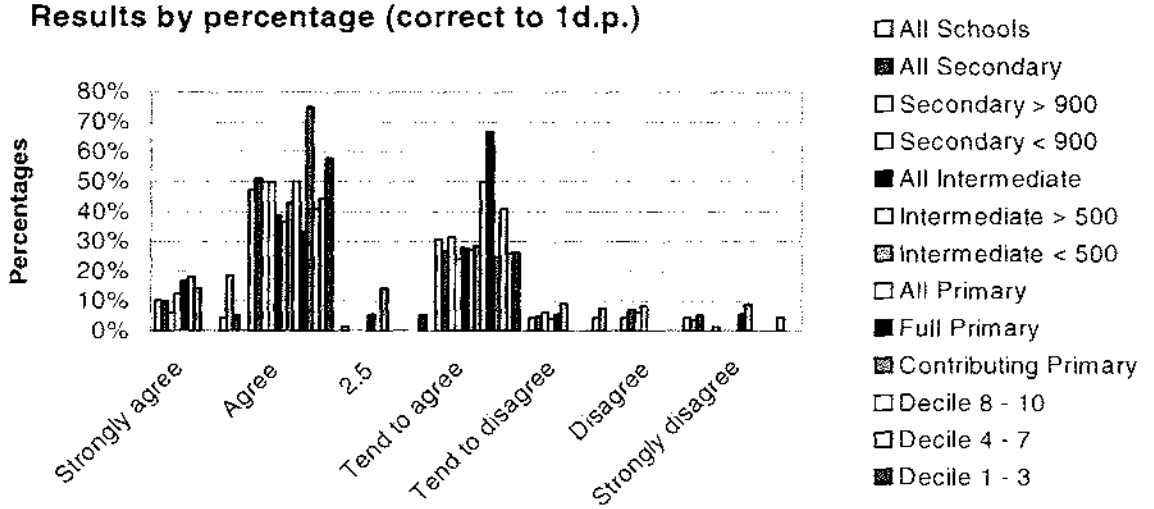
Generally, low ability students tend to be behaviour problems, have many off-task behaviours or opting-out behaviour

4.11 Some Possible Reasons for Students' Low Achievements

This section deals with the final set of questions and is a limited attempt to explore teachers' opinions about the possible reasons for students' failure in mathematics. This researcher acknowledges that there are many more possible reasons than the five explored here and that the range of responses is limited by the optional nature of the questions. Once again, responses were invited from the same, six-point, Likert scale

'One reason for students' low achievement could be: Poor attitude toward schooling in general'

Graph 13: "poor attitude towards schooling in general". Results by percentage (correct to 1d.p.)



Note: 2.5 refers to responses between 'agree'(2) and 'tend to agree'(3).

The majority of responses were fairly evenly spread between 'agree' and 'tend to agree'. Not one Primary school 'strongly agreed'; however, neither did they disagree to any significant degree. Of all schools, Secondaries were the most likely to disagree to any extent. Secondary comments reflect teachers' current apprehensions about their students:

> *Lack of goals and motivation* (a small, decile 6 Secondary)
>
> *Attendance a huge problem* (a large, single-sex, decile 5 Secondary)
>
> *Absenteeism can cause huge problems. Lack of gear and organisational skills. Does reflect parental attitudes* (a large, decile 9 Secondary).

These comments were echoed by Primary and Intermediate schools:

> *Lack of home support/interest* (a large, decile 2 Contributing Primary)

Education and learning not fostered at home. Little established learning climate and attitude from years 1 – 6 (a small, decile 3 Intermediate)

Familial influence is huge (a large, decile 10 Intermediate)

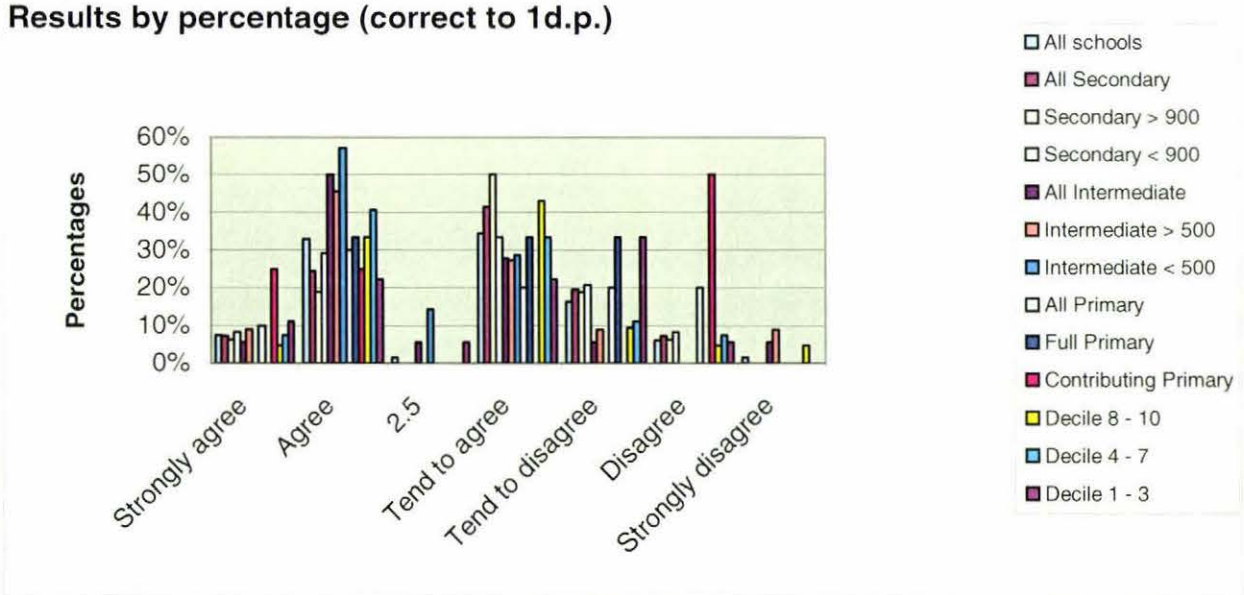
The comments about family influence embrace all school levels and all decile ratings.

In addition, one small, decile 1 Contributing Primary school remarks that poor attitudes towards schooling originate in:

Poor teacher pedagogy and expectations; the impact of no early-childhood broad education; the impact of not having English as a first language

'One reason for students' low achievement could be: Poor attitude towards mathematics in particular'

Graph 14: "Poor attitude towards mathematics in particular". Results by percentage (correct to 1d.p.)



Note: 2.5 refers to responses between 'agree'(2) and 'tend to agree'(3).

There appears to be a definite division of opinion between Primary schools on the one hand and Intermediate and Secondary schools on the other. 40% of all Primary schools 'disagreed' or tended to disagree' with the statement:

> *Maths is made to be fun* (a large, decile 2 Primary)

whilst 77.8% of all Intermediate and 65.9% of all Secondary schools 'agreed' or 'tended to agree':

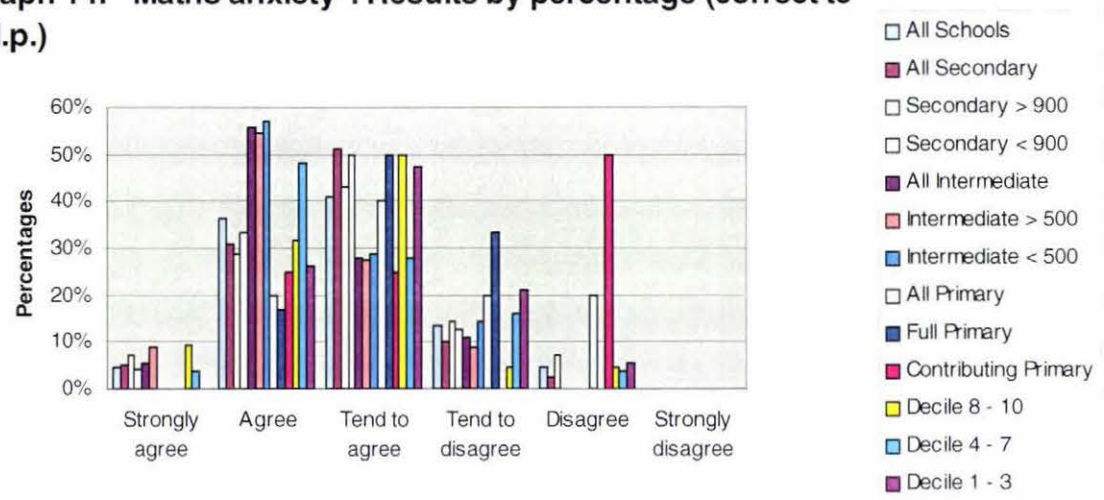
> *They think maths must be, or has to be, hard* (a small, decile 4 Secondary)
>
> *They can't do it, don't like it* (a large, decile 10, private, multi-level school)
>
> *Lack of success in the past* (a small, decile 8, single-sex Secondary)

These opinions are balanced by some that are more optimistic and also that are leaning towards the correction of negativity and despondency among students and teachers:

> *It is a subject which tends to stand alone more than others* (a large, decile 10 Intermediate)
>
> *Sometimes linked to anxiety* (a small, decile 5 Intermediate)
>
> *The correct/incorrect nature of maths can worry low achievers* (a small, multi-level, decile 5, single-sex private school)
>
> *Teachers can change this* (a small, decile 3, multi-level school)

'One reason for students' low achievement could be: Maths Anxiety'

Graph 14: "Maths anxiety". Results by percentage (correct to 1d.p.)



No school 'strongly disagreed' with this statement and the rest of the responses were mainly in the 'agree' (34.4%), 'tend to agree' (40.9%) and 'tend to disagree' (13.6%) areas. No type of school appeared strongly to favour any particular response.

Opinions on maths anxiety were limited in number and tended to be negative and resigned to the situation:

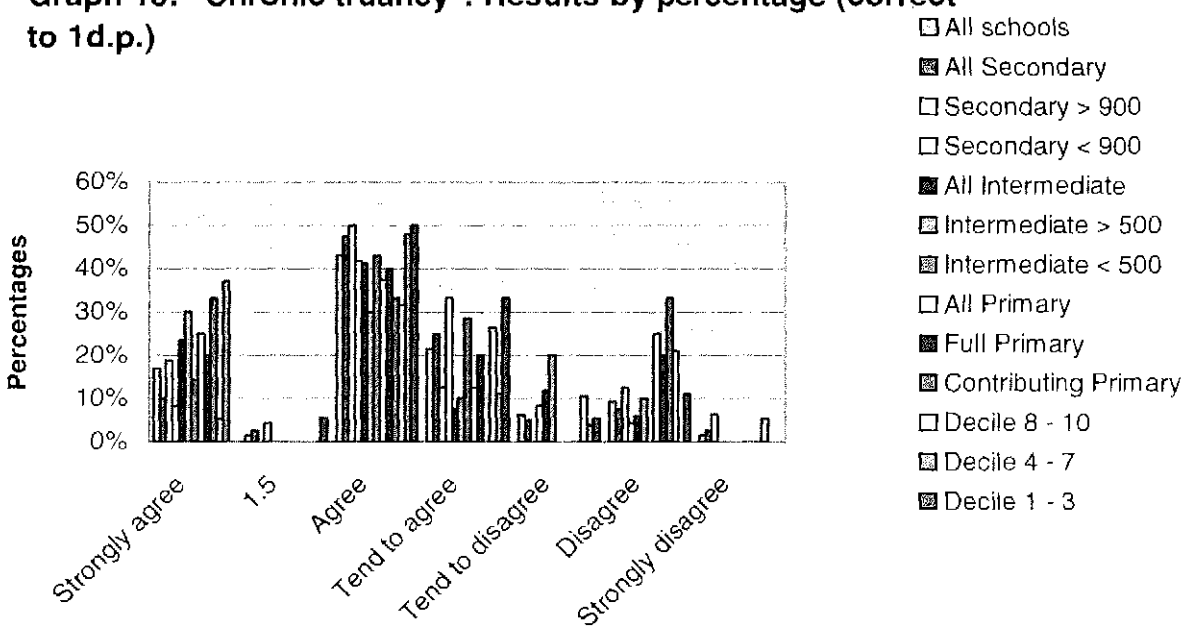
> *They can't be bothered* (a large, decile 5 Full Primary)
>
> *From previous classes* (a large, decile 9 Intermediate)
>
> *Often promoted by home* (a small, decile 3, multi-level school)

Only one school offered a more positive opinion:

Can be reversed by careful teacher attention (a very large, decile 10, single-sex Secondary)

'One reason for students' low achievement could be: Chronic truancy'

Graph 15: "Chronic truancy". Results by percentage (correct to 1d.p.)



Note: 1.5 refers to responses between 'strongly agree'(1) and 'agree'(2).

Once again, the results are skewed towards the agreement section of the graph. Opinions of Contributing Primary schools were evenly split between 'strongly agree', 'agree' and 'disagree', while the opinions of most of the other types of schools were spread between the first four response options.

Comments were also, once again, limited in number but to the point:

Miss out on important learning steps (a large, decile 2 Full Primary)

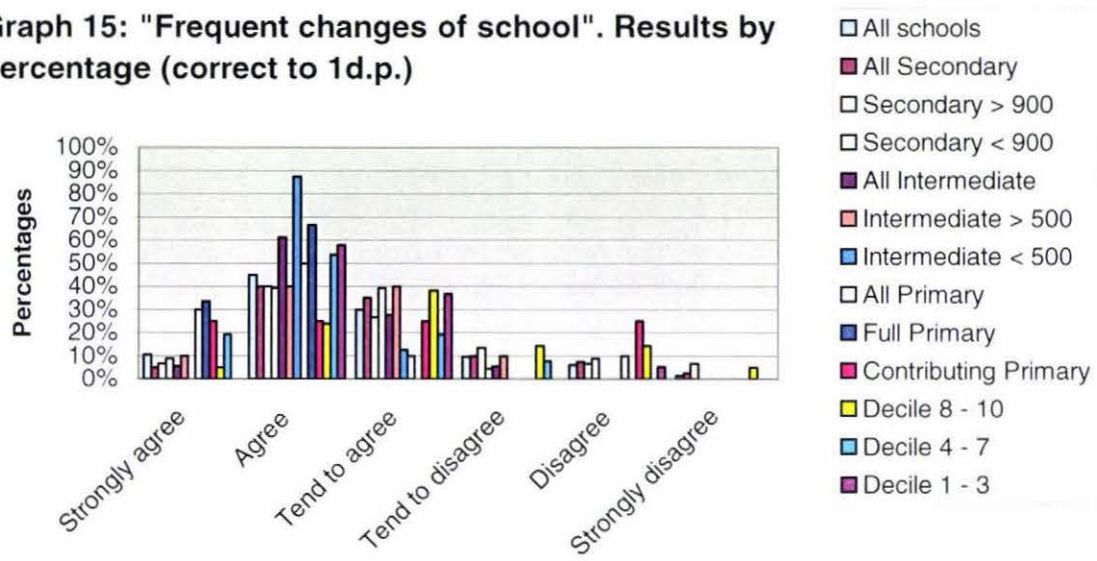
Stay away because they feel inadequate (a small, decile 4 Intermediate)

Extremely high correlation between high attendance and high maths ability (a small, decile 6 Secondary)

The sequential nature of the subject means that it is difficult for students to recover lost time (a very large, decile 10, single-sex Secondary)

'One reason for students' low achievement could be: Frequent changes of school'

Graph 15: "Frequent changes of school". Results by percentage (correct to 1d.p.)



Small Intermediate schools emphatically 'agreed' with the statement (87.5%) along with Full Primary schools (66.7%), none of which chose any indicators in disagreement. Secondary school choices, although generally in 'agreement', were shifted slightly more towards 'disagreement'.

Once again, only a few opinions were offered but many of them were pertinent:

Jump from one programme to another (a large, decile 2 Full Primary)

No base of knowledge to build on – units covered twice or not at all (a large, decile 10 Intermediate)

No consistency (a small, decile 4 Intermediate)

A large number of students in low classes change schools (a decile 5, single-sex Secondary)

Social/home conditions apply here (a small, decile 5, single-sex, private multi-level)

4.12 The Social Outcomes of Being Taught in Ability Grouped Classes. Teachers' Opinions.

'What do you think are the social outcomes for the lowest ability students as a results of being taught with their ability peers?'

The many responses to this question suggests that teachers are very well aware that ability grouping can have a variety of effects on low ability students.

Some comments implied that the students themselves were less concerned with social issues than with achievement:

No concerns in lower classes as long as they are achieving and feel they are

As long as students can smell the scent of success they will do as well as possible in these classes

Awareness of negative social issues was very apparent:

Low self-esteem, lack of belief in who they are and what they can do. Rebel against society, education and people.

Low self-esteem, feel ashamed when they give wrong answers, develop inferiority complexes

[Students] *tend to leave school with lower qualifications*

Can be negative if several students have behavioural problems too

Behaviour problems exacerbated. Students group together, poor role models. Content to stay where they are

However, many positive social outcomes were voiced:

Ability to contribute

More acceptance by peers

Social outcomes beneficial because more confidence in maths

Acceptance of difficulties easier between peers

Develop supportive, competitive and co-operative skills

Reinforcement from others at the same level

Improved sense of worth

Students support each other

Finally, the influence of students' classroom teacher, the programmes offered and the classroom environment were mentioned, as strong influences on social outcomes:

Positive if programme is constructive and effective

Can be very positive as the right teacher can encourage them and create an environment in which they enjoy learning

Teacher attitude significant

Depends on the classroom climate

The teacher must openly recognise the abilities and achievements in these groupings so all can see they are capable of success

4.13 Teachers' Reactions to Being Asked to Teach Mixed Ability Classes

'If your school was to make the decision to regroup all students into randomly mixed, heterogeneous groups, how would you feel?'

The responses to this question were: 11 positive, 43 negative and 19 neutral.

The responses ranged from the horrified:

I would strongly object

Ready to look for another job

Appalled

through the curious:

Surprised but interested in the rationale

Interested, a little concerned, curious to see if it made a difference

and the defiant:

We would still group within class

Groups would need to continue within class to provide pertinent teaching at all levels

to the positive:

Not as happy as I am now but we are flexible

Great – this would force teachers to look at their teaching philosophy

and the anecdotal:

It doesn't work. We lost many above-average academic students to other schools because their parents felt that their child's education was being compromised

One year group unstreamed did not perform well in external exams and less able students became disruptive and disinterested

4.14 Responses from Schools Practising Homogeneous Teaching

Of the 72 usable responses, only 3 schools replied 'no' to ability grouping and only one of those schools was entirely ungrouped. The other two 'no' responses referred to particular year levels that are taught in mixed ability groups while the other year levels are homogeneously grouped.

Schools A and B are both multi-level schools that choose to teach mixed-ability classes at specified year levels. School A is a small, decile 9, private co-educational school; School B is a small, decile 5, single-sex, private school. School C is a large, decile 8, Full Primary school.

The Assignment of Students to Mixed-Ability Classes

The rationales for keeping students mixed in mathematics classes appear to be more to do with practical, rather than pedagogical purposes:

> *Not enough teachers to run parallel timetable (School A)*
>
> *To keep class structures built up in the Junior School boarding houses at years 5 – 8* (School B)

The assigning of students to classes is interesting:

> *From the age and level in students' previous schools* (School A)
>
> *By boarding form groups* (School B)
>
> *Senior management sets criteria i.e. teacher strengths/students temperament and tries for a balanced class, gender etc* (School C)

Perceived advantages and disadvantages of ability grouping

School A's perceived disadvantage of ability grouping was:

> *The need for more teachers*

While School C remarked:

> *Teachers of each student not able to follow progress with maths at a regimented time*

School A acknowledged one particular advantage in ability grouping:

> *Help with students at either end of ability range*

While School C noted two advantages:

> *Parents like students to be extended or helped depending on point of view. Easy to provide for one group*

The Experiences and Social Outcomes of Low Ability Students in Mixed-Ability Classes

'What do you think are the social outcomes for the lowest ability students as a result of being taught in mixed ability classes?'

> [Students] *strive to improve, use of buddy system* (School C)

> *They drop behind, disrupt and seek to hold up class progress for safety and not being left behind* (School B)

> *More able help less able* (School A)

The following three statements were to be answered by choosing responses on the same six-point Likert scale used in previous statement responses.

Low ability students in mixed ability groups appear to learn well

Schools C and A 'agreed' and 'tended to agree' respectively with the statement while School B 'disagreed'. There were no comments made.

Low ability students in mixed ability groups have high self-esteem

Schools A and B both 'disagreed' with the statement while School C chose the absolute centre between 'tend to agree' and 'disagree'.

Depends how they come into class (School C)

Low ability students in mixed ability classes are motivated to learn

School C 'tended to agree' and School B 'tended to disagree' with the statement while School A chose between those two responses.

Most students want to improve (School C)

Depends on the classroom style of the teacher and opportunities to catch up (School B)

There is a definite theme apparent, throughout teachers' responses, of dedication to, and care for, those students who struggle with mathematics. Schools see a definite need to group these students together in order to give them the best of all possible chances to learn and achieve. However, much awareness of the need for LD students to be exposed to the learning of their more able peers is also apparent, which highlights the world-wide dichotomy of whether or not to group students by ability for their mathematics learning.

The large numbers of 'Yes' responses to the question of ability grouping gives some indication of how the issue is being handled in New Zealand. At the same time, many responses acknowledge the possible stereotyping problems and cultural ramifications inherent in the practice.

Chapter 5
Discussion and Conclusion

5.1 Schools' Rationales and Teachers' Opinions about Grouping

One of the main reasons for international researchers' stand against ability grouping is the perceived detrimental effects on students with low ability (e.g. Fuglini & Eccles, 1995; Kerkhoff, 1986; Leonard, 2001). Nevertheless, it is clear from responses to this study that teachers in New Zealand are strongly in favour of ability grouping and perceive there to be many advantages in the practice.

International research concludes that ability grouping is not good teaching practice (e.g., Hallam, 2000; Loveless, 1999; Rosenbaum, 1984; Zevenbergen, 2001). Contrary to that finding, 99% of respondents in this study reported that some form of ability grouping for mathematics is implemented in their schools. For those particular schools, the common reasons among responses in favour include the necessity for needs-based learning at all levels; the ability to cater to individual abilities; and extra teacher support at the two ability extremes.

Teachers in this study are very aware of both the advantages and disadvantages of ability grouping. Advantages mentioned tend to mirror those comments made about schools' rationales *for* grouping. In addition, further comments were made concerning the need for preventing the more able students from being held back by slower students; suitable pace and content for all levels; and issues relating to the self-esteem of the lower achieving students.

Comments about disadvantages tend to be concerned, in the main, with stereotyping at the ability extremes, equity issues, incorrect identification of students' abilities and the difficulties of finding an appropriate teacher for the low ability classes. Equity issues and misidentification are also frequently articulated as significant concerns for international researchers (Rosenbaum, 1984; Troyna, 1992).

5.2 The Group Selection Process and Group Divisions

The process

Riccio (1985), in a review of general facts and issues about ability grouping, summarises, and makes some observations about, the most common methods of assignment to groups. These are IQ tests, norm-referenced achievement tests and teacher recommendations. Riccio claims that IQ tests do not measure potential ability but are discriminatory on ethnic and SES grounds. Norm-referenced achievement tests, aimed at particular age groups, are similar to the Progressive Achievement Tests (PAT) used in New Zealand. Riccio maintains that the results of norm-referenced tests have a high correlation with IQ tests with the exception of their distribution to ethnic minority students. Riccio also makes the point that teacher recommendations are highly subjective and that placement into groups using this method often depends on informal assessment of students' behaviour (both good and bad), sometimes after only a short time of teachers knowing the students.

In this study, throughout all age levels, 22% of the schools assessed through PAT. In some schools (40%), the schools' own tests allow for the targeting of questions towards schools' particular expectations of where students should be in their learning. In New Zealand, this also means matching expectations to levels in the National Mathematics Curriculum Document (Ministry of Education, 1992).

Not many schools rely solely on teacher observations (17%) but commonly use this selection method in conjunction with formal testing. A variety of school staff become involved in grouping decisions, including syndicate and team leaders, Heads of Departments, Deans of levels and Deputy Principals. Very little comment was made about student or parent input, unlike in Israel, where placements are reached by negotiation between schools, students and parents (Resh, 1998).

It is of concern to this researcher that there appears to be a lack of selection *consistency* between the schools in this study and that students (especially those moving to new schools) may be misplaced when compared to similar ability students in other schools. What is considered high ability in one school may be average ability in another.

Schools appear not to be checking the validity of their assessments, apart from re-testing students as a check to correct placements. It is of concern that schools' own tests may not be allowing *all* students to demonstrate their abilities. Poor readers and students with English as a Second or Other Language (ESOL) can be disadvantaged by questions containing too much English language.

The National PAT needs to be carefully assessed for the same reason. As an example of a poor, year 8 mathematics question, the following is typical:

> *Rua wanted to estimate the quotient in a division.*
> *He said, '10 X divisor equals 740, and 100 X divisor*
> *equals 7 400'. If the dividend is between 740 and*
> *7 400, the quotient is between*
>
> *(A) 10 and 100*
> *(B) 10 and 740*
> *(C) 100 and 740*
> *(D) 100 and 7 400*
> *(E) 740 and 7 400* (Question 125)

This question would be almost incomprehensible to poor readers or ESOL students.

Group divisions

Secondary schools are the most likely to group between classes and across all subjects. While some schools group across *all* subjects, others group solely across *core* subjects (i.e. mathematics, English, social studies and science).

Variations include schools grouping their students just for mathematics, students grouped at the top and bottom ability extremes with the rest randomly mixed and special homerooms in Secondary schools. Primary and Intermediate schools typically tend to work on the homeroom system anyway and use more within-class grouping together with the withdrawal of small groups for specialised teaching.

5.3 The Experiences of Low Ability Students in Homogeneous Classes

A number of questions were posed in an attempt to discover how low ability students experience mathematics in homogeneous classes. The questions were concerned with exploring special teaching programmes, assessment of students' learning and the teachers assigned to the low ability groups. In addition, teachers' opinions were sought regarding how advantageous ability grouping is for students with low ability.

Teaching programmes

The first question concerned the teaching programmes used. The list offered for choice was: 'Specially designed course', 'A softened version of the National Curriculum', Lower levels of the National Curriculum', 'A mixture of above' and 'Other'. Intermediate and Secondary schools typically responded 'A mixture' (41% of all schools), which confirms this researcher's personal experience of the usefulness of many different resources from many different sources.

Lower levels of the National Curriculum are more likely to be used by Primary schools (40% of all Primary school responses). All three school types also use their own specially designed courses, often in conjunction with lower levels of the National Curriculum (12% of all responses).

Some conscientiousness is apparent in teachers' descriptions of attempts to assess the validity of programmes. Written reports, pre- and post-tests, reviews, discussions at faculty levels as well as student and parent feedback, are variously used at all school levels in order to appraise the soundness of programmes.

One Intermediate school pointed out that teacher professionalism/observation was enough to check a programme's validity and this was echoed by teachers in both Primary and Secondary schools. What is more disquieting, however, is the Secondary school HOD who assumes that "correct placement of students in year 11", satisfactorily assesses a previous year's programme.

Assessment of learning

Schools appear to be more rigorous in their assessing of students than they are in assessing programmes. For Primary and Intermediate schools, pre- and post-tests are typically used to assess students' progress, closely followed by teacher observations. These schools are also more inclined to use less traditional forms of assessments such as students' self-assessment, conferencing or personal interview and anecdotal evidence. Secondary schools, on the other hand, are more likely to use the traditional areas of assessment such as tests and exams, with only an occasional mention of more innovative assessment methods such as teacher observations and activities.

Teachers of low ability groups

HODs were asked to respond to four statements about the teachers who teach the lowest ability groups. The responses indicate that, apart from in large Intermediate schools, very few students are taught by a specialist teacher of learning difficulties. On the other hand, these students are very likely to be taught by a well-qualified mathematics teacher in all schools, except for Primary and small Intermediate schools.

There was a time when Secondary schools commonly used teachers from departments, other than mathematics, to teach the lowest ability groups but from the results of this study, the practice appears to be on the decline. This statement was unlikely to be relevant to Primary and Intermediate schools and the 100% 'no' response from all Primary and small Intermediate schools was to be expected. Secondary schools with low decile ratings are most likely to use teachers from other departments; however, even in those schools, the 'yes' response was only 30%.

Very few schools are likely to ask teachers to take turns with any particular ability group and, in fact, many schools reported that only teachers willing to do so are allocated to the lowest groups. For Primary schools, the classroom teacher tends to teach *all* ability groups, often with the help of a teacher aide. Some Secondary schools mention that they particularly employ Primary trained teachers for their lowest ability groups but there is also a growing band of teachers, with experience of teaching students with LD, who are customarily teaching those groups.

HODs were asked to describe the best person to teach the students in the lowest ability group. Putting together the ideal teacher from the responses results in a paragon of virtue. This teacher is patient, motivated, mathematically qualified, knowledgeable, enthusiastic, a good planner, familiar with the variety of learning styles, understanding of individual needs, experienced, a good manager and passionate about teaching students with LD.

For Secondary schools, a specialist teacher in low ability mathematics teaching is deemed to be more preferable, as a teacher for low achievers, than someone with a good understanding of mathematics. Low ability classes often include students with behaviour problems and good classroom management is perceived to be an essential attribute, as is being able to relate well to these students. Curiously, it is the Primary and Intermediate schools which are most in favour of using a well-qualified mathematics teacher for the task.

Low achievers in homogeneous classes

The majority of responses strongly supported the statement that ability grouping has advantages for students with low ability. Only small Primary schools and those with low decile ratings disagreed with the statement. Reasons given for agreement include the likelihood of the classes being small (allowing for more teacher attention); students working at a suitable pace with a suitable programme; and students being made to feel more comfortable by being taught with their ability peers.

Social outcomes

HODs were asked their opinions about the social outcomes for the lowest ability students as a result of being taught with their ability peers. It is clear that teachers are very aware of the varied effects, both positive and negative, that ability grouping can have on students. Concern is shown that students may have low self-esteem and low opinions of themselves ("we are 'meatballs', 'dummies'") and a lack of confidence in themselves. However, the perception of positive social outcomes far outnumber the negative. Many HODs commented on students' perceived sense of worth, students' readiness to answer questions and become risk takers, improved confidence with mathematics and with themselves and the likelihood of students supporting each other. It was also noted that some students actually have a chance to be 'top of the class', a position very unlikely for these students to achieve in a heterogeneous class.

5.4 Self-Esteem and Motivation

Self-esteem

Whether or not a student appears to be 'happy' in class can give a teacher some indication of students' levels of self-esteem. On the whole, the respondents in this study report that their students do appear to be happy in class. 79.1% of all schools either agreed or tended to agree that students were happier when grouped by ability. Because students in low ability groups have only students with similar ability with whom to compare themselves, they are more likely to have higher self-esteem than if they were comparing themselves with high achieving students in heterogeneous classes (Wong & Watkins, 2001).

It is clear from many responses that teachers are very aware of how their low ability students' self-esteem is affected by learning in a homogeneous environment. Their comments included statements to the effect that students were not being intimidated by high achievers and that students become more academically confident as they become more comfortable with what they are learning. Students' needs are being met in homogeneous classes; they hear, and use, suitable mathematics vocabulary and they achieve success without comparisons.

However, some HODs do not believe that their lowest ability students have high self-esteem, especially as these students are perceived to be experiencing problems in other areas as well. For example, other subject areas, their home lives and social acceptance or rejection by their peers. A significant 22.8% of responses from all schools did not agree that their students have high self-esteem in homogeneous classrooms.

Motivation

Chapman (1992) maintains that, after repeated failure, lack of motivation is at the heart of most learning difficulties, while the opposite is also deemed to be valid. That is, previous success leads to high self-esteem, which motivates students to repeat the experience (Pressley & McCormick, 1995).

When asked to comment on motivation, HODs in this study agreed, to some extent, that their students are motivated to learn. However, some qualifying comments mentioned dependence on such factors as teacher quality and enthusiasm, student to teacher ratios, classroom climate and the programmes being used. Some comments echoed international research inasmuch as 'success breeds success' while 'failure breeds failure'. One teacher's comment mirrors this researcher's knowledge of how students feel about being in the lowest ability group. That is, students are pleased to at last have the opportunity to be top of the class: "Can be top in own group therefore not bottom all the time".

5.5 Students' Attitudes, Maths Anxiety and the Effects of Truancy and Student Mobility – Teachers' Opinions

There are potentially as many reasons for students' low achievements as there are students. This study sought HODs' opinions on just five possible reasons – students' poor attitudes towards school in general and mathematics in particular, maths anxiety, chronic truancy and student mobility.

Attitudes

The response to the questions concerning students' attitudes indicates that teachers tend to regard factors beyond the students themselves as being to blame for a poor attitude towards schooling in general. Familial influences are considered to be significant sources of poor attitude, due to education and

learning not being fostered at home. Students' lack of mathematical gear such as calculators, compasses and rulers, and limited organisational skills are also regarded as critical influences on attitude.

Students' attitudes towards schooling in general led to 89.8% agreement with the statement. On the other hand, students' poor attitudes towards mathematics in particular were not generally seen by HODs as a reason for students' low achievement and resulted in only a few opinions being offered. 76.1% of responses agreed with the statement while only 13.5% disagreed. Teachers think that students perceive mathematics to be a difficult curriculum subject and if students think that they 'can't do it', this can translate into 'won't do it' even though most students are aware of the importance of mathematics to their lives.

Maths anxiety

Stipek (1988) maintains that there is a link between anxiety and threatened self-esteem, while Dossel (1993) suggests that maths anxiety and poor achievement are both caused by students' poor learning environments, exacerbated by the effects of public failure, competitive classrooms, and students' self-perceptions regarding their difficulties with mathematics. Other studies have found significant links between maths anxiety and mathematics achievement (Ma, 1999; Ma & Kishor, 1997). In this study, there were very few opinions offered about the maths anxiety statement but 81.8% of respondents agreed with the statement. HODs appear to be resigned to those students in the lowest ability groups suffering from maths anxiety.

Chronic truancy and student mobility

It is a commonly held belief among teachers (this researcher included) that low achievement is a *consequence* of chronic truancy and student mobility. However, there are suggestions that this might not always be the case. It is possible that truancy is linked to family functioning (Fergusson, Lynskey, &

Horwood, 1996) and that mobility often *precedes* low achievement rather than following it (Wright, 1999). 73% of HODs in all schools agreed, to some extent, that chronic truancy could cause low achievement, while 85.1% agreed that frequent changes of school could cause low achievement.

Again, there were only a few opinions offered for these two statements. It is suggested that some students "stay away from school because they feel inadequate" or "cannot read". One HOD suggests that the inherent character of the mathematics' curriculum may be a major problem. "The sequential nature of the subject means that it is difficult for students to recover lost time". Another HOD looked at the statement from the opposite perspective. "Extremely high correlation between high attendance and high maths ability".

This last opinion links into those concerning student mobility considerations. For example, "units of work covered twice or not at all", "lack of consistency in teaching and materials used" and the very pertinent opinion that it is "the students in the lowest classes who are the most likely to be mobile".

5.6 Experiences in Schools Practising Heterogeneous Teaching

Only three schools responded that they do not group students by ability for mathematics and as only one of those schools practices heterogeneous teaching throughout all levels, there is very little data on which to comment.

The reasons for *not* grouping by ability appear to be pragmatic rather than philosophical. Shortage of the teachers who would be needed to run parallel, timetabled classes and the need for particular class structures to match a boarding school structure, were clear reasons for not grouping. The third school had tried ability grouping during the year previous to the study but reverted to heterogeneous classes in response to classroom teachers' indication that they would prefer to stay with their own students, rather than losing some of them to other teachers and then having to receive others in from other classes.

Two of the HODs were able to see some advantages in ability grouping, especially in the particular help that can be offered to the ability extremes. One of the HODs regards the social outcomes for low ability students taught in mixed ability classes as poor, with the students dropping behind and behaving in a disruptive manner. The other two HODs, however, were more optimistic, regarding the use of a buddy system as well as the more able helping the less able as important positives. Finally, when asked to comment on an imaginary change for the school, from heterogeneous to homogeneous classes, one of the three HODs would be "very surprised" while another would be "very pleased ..... it's hard going".

5.7 Implications of the Study

National implications

There are multiple reasons why students do not achieve in mathematics. Many students are not, in fact, low achievers but appear in low ability classes as a consequence of a number of factors. It is this researcher's contention that two national resources would be helpful to schools to reduce the numbers of students in low ability classes. First, a database would allow all schools to keep track of mobile students. This database could be enhanced by a nation-wide truancy service that would help to minimise the incidence of chronic truancy. In addition, when family or community problems are an issue, it is imperative that funds be made available to help communities educate parents of school-aged children to lift adults' mathematics, English language and parenting skills. This, in turn, would help, not only to lift the self-esteem of students and their families but also to boost students' motivation to learn.

Implications for schools

Schools need to take current research and best practice into account, in order to formulate the policies needed to address the issue of student

underachievement. Procedures to identify underachievement should be rigorous and these should be left in place for testing incoming students throughout the school year. Helpful resources need to be purchased. Ongoing training in the teaching of low achievers needs to be a part of all schools' professional development programmes. Also schools need to open their doors to the parents of low achievers as it is possible that they also need to learn mathematics and English.

5.8 Further Research

There is a paucity of research about low achieving students in New Zealand. International research, although of some help, does not address issues and concerns that are unique to New Zealand. Neither does it offer much in the way of practical help for New Zealand's particular multicultural learning environments.

1. A major issue resulting from this study is the high percentage of schools developing their own tests in order to establish the correct groups for their students. It is of concern to this researcher that, in testing procedures, there is no consistency across the country. Research is needed to establish the level of tests used, which could lead to a National, consistent, group-setting assessment. One possible approach would be to consider the assessment tools employed in the national Numeracy Project, now in widespread use, to identify low achieving students. For this to happen, in the first instance, there needs to be dialogue between schools.

2. There is a need to examine matters unique to the New Zealand culture. A nation-wide, longitudinal study into the effects of student mobility, SES and truancy on school achievement would assist in the formulation of government policy-making and school planning.

3. This survey was completed by teachers who hold responsibilities for mathematics at each school. It would also be of value to hear the views of classroom teachers, principals and Boards of trustees. Of particular interest would be research investigating the experiences of the low achieving students themselves, throughout the country.

4. One of the issues which was not specifically highlighted in this study was that of classroom resources. In order to fund low achieving students adequately, it is necessary to establish which resources are the most beneficial to the learning of low ability students. Research is needed, concerning resources such as textbooks and teacher aides as well as investigations into students' use of manipulatives to aid their learning. Knowing which resources contribute to enhanced mathematical attainment would help schools to plan more cost-effectively.

5. Another issue not specifically examined in this study was that of student behaviour and how it is linked to low achievers (Zevenbergen, 2001). There is a real need for this issue to be studied, in order to give classroom teachers some practical help. Task avoidance behaviours and general 'acting-out' behaviours are more widespread among low achieving students than among those of higher ability. Discovering the 'why' of this behaviour by these particular students could result in the development of better behaviour patterns in low ability classes.

5.9 Conclusion

On the whole, New Zealand schools are providing for their underachievers in a supportive, understanding and caring manner. Despite the large body of international research against it, ability grouping is practised in the majority of the schools in this study and the lowest ability students are benefiting from programmes and teaching methods, which are focussed on their particular needs.

When students with learning difficulties are taught in mainstreamed classes, it is important that their special learning needs are not ignored. Placing them in low ability mathematics classes of small class size, allows teachers to concentrate their efforts on them and aid their mathematical development with specially designed curricula and facilitative settings. As LD students themselves appear to prefer working in a specialised class, rather than being included in mixed ability classes (Jenkins & Heinen, 1989; Lou, Abrami, & Spence, 2000; Scruggs & Mastropieri, 1995), it is appropriate that their preferences are met and that they are provided with the best possible learning experiences.

If schools aspire to improving their lowest achieving students' mathematics skills, it is clear that students' self-esteem, maths anxiety and motivation need to be addressed. As long as students have low opinions of themselves and little motivation to improve, their learning is unlikely to progress beyond basic skills. However, only reliable selection processes and sound teaching programmes, taught by suitably skilled personnel, will ensure the best possible learning environments for students who underachieve mathematically.

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Appendix A: Information letter sent to Heads of Departments

Massey University
COLLEGE OF EDUCATION
Te Kupenga o Te Mātauranga

Department of Technology, Science and Mathematics Education
Private Bag 11 222,
Palmerston North,
New Zealand
Telephone: 64 6 356 9099
Facsimile: 64 6 351 3472

Isolating students with mathematical learning difficulties for teaching purposes: The New Zealand experience

INFORMATION SHEET

My name is Liz Siber, I am a teacher of mathematics at Hamilton's Fraser High School where the majority of my students have some form of learning difficulty. I am also a postgraduate student who is about to embark on a Master's research thesis and am seeking your support to complete a survey. Your school is one of a systematically sampled mixture of Secondary, Intermediate/Middle and Primary schools in the ratio 2:1:1. from within three regions in the North Island (Special schools have been removed as they are not expected to yield any effective data). The sample was obtained from the Te Kete Ipurangi website at http://www.tki.org.nz. One hundred and fifteen information sheets are being posted which it is hoped will result in about 80 positive responses. This number is sufficient to give a broad picture of New Zealand schools.

Anecdotal evidence suggests that ability grouping is common practice in New Zealand even though much international research has demonstrated that there is no advantage to be gained by it. I hope to discover some of the reasons for this anomaly as well as inviting your personal opinions about the issue.

The research will take the form of a survey, firstly to ascertain schools' reasons for or against grouping students by ability for the purpose of teaching mathematics and secondly to ascertain the processes used to achieve the grouping.

I will also be looking at the possibility of some correlation between school factors, such as decile rating and roll, and the decision to group by ability or not. The data will be analysed both quantitatively and qualitatively. The data will be stored for 5 years after which it will be destroyed.

I hope you will be encouraged to participate, even if the mathematics classes at your school are not ability grouped. It is estimated that the survey should take no longer than 30 minutes to complete.

If you do decide to complete the questionnaire, please know that you have the right to decline to answer any particular question.

I anticipate that most questionnaires will be completed by teachers with responsibility for mathematics. However, I will be able to visit some schools in order to personally interview and oversee the completion of the questionnaire. Please indicate on the consent form if you have a particular preference for either arrangement.

A summary of the survey's findings will be available on request to my e-mail address.

This project has been reviewed and approved by Massey University College of Education Ethics Committee, Palmerston North. If you have any concerns about the conduct of this research, please contact my supervisor – address below.

If you require any additional information please contact me or my research supervisor.

My contact details:
Liz Siber
[redacted]
HAMILTON
[redacted]

My supervisor's details:
Dr Margaret Walshaw
Dept. of Technology, Science & Mathematics
College of Education, Massey University
Private Bag 11222
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Thanking you in anticipation

Liz Siber

Isolating students with mathematical learning difficulties for teaching purposes: The New Zealand experience

This initial consent form is merely to indicate your willingness to participate in the survey. Please return it in the stamped, addressed envelope provided.

School.....

Contact name.....

We will be pleased to take part, and ☐

We would prefer to be interviewed ☐

We would prefer to complete a postal survey ☐

We have no preference ☐

Signed_____ Date_____

We do not wish to take part ☐

A questionnaire with an official consent form will be posted on receipt of this initial consent

Appendix B: Covering Letter

Liz Siber
[redacted]

Dear Respondent

Many thanks for agreeing to take part in my research survey by completing the questionnaire. I realise that a task like this is just 'one more thing' in your too busy life and can only thank you once again and say how much I appreciate your input.

Please find enclosed:

- one consent form which needs to be signed and returned with the questionnaire
- one confidentiality agreement for your records
- the questionnaire with cover page
- one stamped, addressed envelope for the return of the questionnaire

I would like to clarify the term **ability grouping** that I have used throughout the questionnaire. I am interested in any form of ability grouping, for example:

- streaming of a whole class for all core subjects
- banding of a class just for mathematics
- removal of some students for specialist mathematics teaching away from the rest of the class
- within class grouping to allow students of similar mathematical ability to work together

Liz Siber

Appendix C: The Questionnaire

QUESTIONNAIRE

FOR A MASTERATE THESIS

"Isolating students with mathematical learning difficulties for teaching purposes: The New Zealand experience".

Masterate researcher: Liz Siber

Research supervisor: Dr. Margaret Walshaw

Instructions for completing the survey:

- Please indicate your answers by ticking the boxes or by writing in the spaces provided
- If you need more space to write your answers, please use the back of the relevant page
- Please print your answers clearly
- You have the right to decline to answer any particular question

Completion of any part of this survey implies consent to use this information in research reports with the proviso that no individual school is identified and all individual responses are confidential to the researcher and supervisor.

This project has been reviewed and approved by Massey University College of Education Ethics Committee, Palmerston North. If you have any concerns about the conduct of this research, please contact Dr. Margaret Walshaw, Department of Technology, Science and Mathematics, College of Education, Massey University, Private Bag 11222, Palmerston North. e-mail m.a.walshaw@massey.ac.nz

Full name of school.....

SECTION 1 School Policy

1 Are students in your school grouped by ability, in any way, for mathematics lessons? yes ☐ no ☐

If yes, please go to question 2.

If no, please go to question 33.

2 What is the school's rationale for grouping?

.....

.....

3 What does the school consider to be the advantages in grouping by ability?

.....

.....

4 What does the school consider to be the disadvantages in grouping by ability?

.....

.....

5 On what basis are the groups selected? PAT ☐

IQ test ☐

School's own test ☐

Other (please explain) ☐

.....

.....

6 How is the validity of the assessment assessed? (For example, are group placements checked by further assessments?)

.....

.....

7 How are the groups divided? Between classes ☐

Within class ☐

Across all subjects ☐

Small pull-out class ☐

Other (please explain) ☐

.....

.....

8 At which year level does grouping begin?.....

9 At which year level does grouping cease?.....

10 Who decides on the composition of groups?

.....

11 Is there any movement out of classes set by ability yes ☐

no ☐

12 Please explain how often and in which direction

.....

.....

Concentrating on the lowest ability groups:

13 What programmes are used to teach these students?

Specially designed courses ☐

A softened version of the National Curriculum ☐

Lower levels of the National Curriculum ☐

A mixture of above ☐

Other (please explain) ☐

.....

.....

14 How is the programme validity assessed?

.....

.....

.....

15 Please describe how your students' learning is assessed

.....

.....

.....

SECTION 2 The Teachers

About the teachers who teach the lowest ability groups:

16 It is usually a specialist teacher of learning difficulties yes ☐
no ☐

17 It is a teacher well-qualified in mathematics yes ☐
no ☐

18 It is often a teacher brought in from another department yes ☐
no ☐

19 It is someone's 'turn' with the lowest ability groups yes ☐
no ☐

20 Other (Please explain).....

SECTION 3 Personal Opinions

21 Please give your opinion about who is the best person to teach the students in the lowest ability groups

.....

.....

22 Grouping students by ability for teaching mathematics has advantages for all students

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

23 Grouping students by ability for teaching mathematics has advantages for students with high ability

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

24 Grouping students by ability for teaching mathematics has advantages for students with average ability

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

25 Grouping students by ability for teaching mathematics has advantages for students with low ability

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

26 When grouped by ability, those students in the lowest groups appear to be happy

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

27 Low ability classes can be productive places of learning

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

28 When grouped by ability, those students in the lowest groups appear to have high self-esteem

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

29 When grouped by ability, those students in the lowest groups are motivated to learn

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

30 Some reasons for students' low achievements could be:

* poor attitude toward schooling in general

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

* poor attitude toward mathematics in particular

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

* maths anxiety

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

* chronic truancy

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

* frequent changes of school

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

31 What do you think are the social outcomes for the lowest ability students as a result of being taught with their ability peers?

.....

.....

.....

32 If your school was to make the decision to regroup all students into randomly mixed, heterogeneous groups, how would you feel?

.....

.....

.....

That was the final question for those who answered 'yes' to Question 1

Thank you once again for your help.

SECTION 4 **For those who answered 'no' to question 1**

33 What is the school's rationale for not grouping by ability?

.....

.....

.....

34 What does the school consider to be the disadvantages of grouping by ability?

.....

.....

.....

35 Does the school consider there to be *any* advantages of grouping by ability?

.....

.....

.....

36 How are students assigned to classes in your school?

.....

.....

.....

37 What do you think are the social outcomes for the lowest ability students as a result of being taught in mixed ability classes?

.....

.....

.....

38 Low ability students in mixed ability groups appear to learn well

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

39 Low ability students in mixed ability groups have high self-esteem

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

40 Low ability students in mixed ability groups are motivated to learn

strongly agree	agree	tend to agree	tend to disagree	disagree	strongly disagree
☐	☐	☐	☐	☐	☐

Optional comment.....

.....

41 If your school was to make the decision to group all students by ability for mathematics classes, how would you feel?

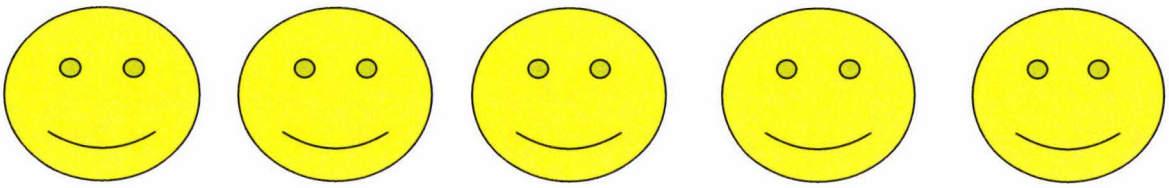
.....

.....

That was the final question

Thank you once again for your time

Appendix D: Reminder letter



A GENTLE REMINDER

Liz Siber
5 Hampstead Way
HAMILTON

26th April 2003

Dear

If it has been a while since you received the questionnaire from me, it is possible that it has vanished under the pile of 'things to do' on your desk. I have already received a number of completed questionnaires which are showing some interesting trends and would really like to see yours, to add to the results.

If you have already returned your questionnaire, perhaps you could send me a sample of your handwriting as I have had 3 replies without identification and would love to add them to particular results such as Primary Schools or Rural Schools.

Thank you for your time

Liz Siber

Appendix E: Tables of Results

All results by percentage

Question 16 'It is usually a specialist teacher of learning difficulties'

School Type	Yes	No
All Schools	42	58
All Secondary	24	76
Secondary > 900	27	73
Secondary < 900	21	79
All Intermediate/Middle	47	53
Intermediate/Middle > 500	70	30
Intermediate/Middle < 500	20	80
All Primary	33	67
Full Primary	33	67
Contributing Primary	33	67
Decile 8 – 10	25	75
Decile 4 – 7	36	64
Decile 1 - 3	33	67

Question 17 "It is a teacher well-qualified in mathematics"

School Type	Yes	No
All Schools	72	28
All Secondary	84	16
Secondary > 900	86	14
Secondary < 900	83	17
All Intermediate/Middle	56	44
Intermediate/Middle > 500	33	67
Intermediate/Middle < 500	80	20
All Primary	40	60
Full Primary	33	67
Contributing Primary	50	50
Decile 8 – 10	87	13
Decile 4 – 7	67	33
Decile 1 - 3	67	33

Question 18 "It is often a teacher brought in from another department"

School Type	Yes	No
All Schools	17	83
All Secondary	21	79
Secondary > 900	23	77
Secondary < 900	19	81
All Intermediate/Middle	9	91
Intermediate/Middle > 500	20	80
Intermediate/Middle < 500	0	100
All Primary	0	100
Full Primary	0	100
Contributing Primary	0	100
Decile 8 – 10	14	86
Decile 4 – 7	10	90
Decile 1 - 3	30	70

Question 19 "It is someone's 'turn' with the lowest ability groups"

School Type	Yes	No
All Schools	23	77
All Secondary	28	72
Secondary > 900	46	54
Secondary < 900	13	87
All Intermediate/Middle	20	80
Intermediate/Middle > 500	0	100
Intermediate/Middle < 500	50	50
All Primary	0	100
Full Primary	0	100
Contributing Primary	0	100
Decile 8 – 10	29	71
Decile 4 – 7	19	81
Decile 1 - 3	22	38

Question 22 "Grouping students by ability for teaching mathematics has advantages for all students"

School Type	Strongly agree	Agree	Tend to agree	3.5	Tend to disagree	Disagree	Strongly disagree
All Schools	30.4	44.9	13	1.4	4.3	2.9	2.9
All Secondary	27.5	55	10		2.5	2.5	2.5
Secondary > 900	43.8	37.5	12.5		6.3	0	0
Secondary < 900	21.7	60.9	8.7		0	4.3	4.3
All Intermediate/Middle	33.3	27.8	22.2		5.6	5.6	5.6
Intermediate/Middle > 500	30	40	10		0	10	10
Intermediate/Middle < 500	37.5	12.5	37.5		12.5	0	0
All Primary	20	50	10	10	10	0	0
Full Primary	16.7	50	0	16.7	16.7	0	0
Contributing Primary	25	50	25		0	0	0
Decile 8 – 10	19	61.9	9.5		4.8	4.8	0
Decile 4 – 7	46.2	34.6	7.7	3.8	3.8	3.8	0
Decile 1 - 3	21.1	42.1	26.3		0	0	10.5

Question 23 "Grouping students by ability for teaching mathematics has advantages for students with high ability"

School Type	Strongly agree	Agree	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	53.6	36.2	5.8	0	2.9	1.4
All Secondary	70	25	2.5	0	2.5	0
Secondary > 900	75	18.8	0	0	6.3	0
Secondary < 900	65.2	30.4	4.3	0	0	0
All Intermediate/Middle	44.4	44.4	5.6	0	0	5.6
Intermediate/Middle > 500	40	40	10	0	0	10
Intermediate/Middle < 500	50	50	0	0	0	0
All Primary	20	60	10	0	10	0
Full Primary	16.7	50	16.7	0	16.7	0
Contributing Primary	25	75	0	0	0	0
Decile 8 – 10	61.9	33.3	4.8	0	0	0
Decile 4 – 7	70.4	22.2	7.4	0	0	0
Decile 1 - 3	26.3	57.9	0	0	10.5	5.3

Question 24 "Grouping students by ability for teaching mathematics has advantages for students with average ability"

School Type	Strongly agree	Agree	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	14.7	47.1	16.2	7.4	2.9	2.9
All Secondary	15.8	47.4	26.3	5.3	2.6	2.6
Secondary > 900	13.3	46.7	26.7	13.3	0	0
Secondary < 900	18.2	45.5	27.3	0	4.5	4.5
All Intermediate/Middle	22.2	38.9	27.8	5.6	0	5.6
Intermediate/Middle > 500	20	40	30	0	0	10
Intermediate/Middle < 500	25	37.5	25	12.5	0	0
All Primary	0	60	10	20	10	0
Full Primary	0	50	0	33.3	16.7	0
Contributing Primary	0	75	25	0	0	0
Decile 8 – 10	10	60	30	0	0	0
Decile 4 – 7	22.2	40.7	18.5	14.8	3.7	0
Decile 1 - 3	11.8	41.2	23.5	5.9	5.9	11.8

Question 25 "Grouping students by ability for teaching mathematics has advantages for students with low ability"

School Type	Strongly agree	Agree	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	36.4	36.4	16.7	3	6	1.5
All Secondary	44.7	42.1	13.2	0	2.6	0
Secondary > 900	37.5	31.3	31.3	0	0	0
Secondary < 900	45.5	45.5	4.5	0	4.5	0
All Intermediate/Middle	38.9	27.8	16.7	5.6	5.6	5.6
Intermediate/Middle > 500	40	30	10	10	0	10
Intermediate/Middle < 500	37.5	25	25	0	12.5	0
All Primary	10	40	20	10	20	0
Full Primary	0	33.3	16.7	16.7	33.3	0
Contributing Primary	25	50	25	0	0	0
Decile 8 – 10	38.1	33.3	28.6	0	0	0
Decile 4 – 7	48.1	33.3	11.1	3.7	3.7	0
Decile 1 - 3	16.7	44.4	11.1	5.6	16.7	5.6

Question 26 "When grouped by ability, those students in the lowest groups appear to be happy"

School Type	Strongly agree	Agree	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	10.4	53.7	25.4	10.4	0	0
All Secondary	5.1	59	28.2	7.7	0	0
Secondary > 900	6.7	40	40	13.3	0	0
Secondary < 900	4.3	69.6	21.7	4.3	0	0
All Intermediate/Middle	10.5	52.6	21.1	15.8	0	0
Intermediate/Middle > 500	9	63.6	18.2	9	0	0
Intermediate/Middle < 500	12.5	37.5	25	25	0	0
All Primary	30	40	20	10	0	0
Full Primary	0	50	33.3	16.7	0	0
Contributing Primary	75	25	0	0	0	0
Decile 8 – 10	20	60	15	5	0	0
Decile 4 – 7	3.7	51.9	33.3	11.1	0	0
Decile 1 - 3	5.3	52.6	26.3	15.8	0	0

Question 27 "Low ability classes can be productive places of learning"

School Type	Strongly agree	Agree	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	33.3	53	6	4.5	3	0
All Secondary	35	55	7.5	2.5	0	0
Secondary > 900	37.5	62.5	0	0	0	0
Secondary < 900	34.8	47.8	13	4.3	0	0
All Intermediate/Middle	36.8	42.1	5.3	5.3	10.5	0
Intermediate/Middle > 500	36.4	54.5	0	0	9	0
Intermediate/Middle < 500	37.5	25	12.5	12.5	12.5	0
All Primary	12.5	75	0	12.5	0	0
Full Primary	0	80	0	20	0	0
Contributing Primary	33.3	66.7	0	0	0	0
Decile 8 – 10	28.6	57.1	4.8	0	9.5	0
Decile 4 – 7	40.7	44.4	7.4	7.4	0	0
Decile 1 - 3	27.8	61.1	5.6	5.6	0	0

Question 28 "When grouped by ability, those students in the lowest groups appear to have high self-esteem"

School Type	Strongly agree	Agree	Tend to agree	3.5	Tend to disagree	Disagree	Strongly disagree
All Schools	4.7	21.9	34.4	3.1	21.9	10.9	3.1
All Secondary	2.7	21.6	37.8	2.7	18.9	13.5	2.7
Secondary > 900	7.1	28.6	21.4		14.3	21.4	7.1
Secondary < 900	0	21.7	43.5	4.3	21.7	8.7	0
All Intermediate/Middle	5.9	23.5	23.5	5.9	29.4	5.9	5.9
Intermediate/Middle > 500	9	27.3	27.3	9	18.2	0	9
Intermediate/Middle < 500	0	16.7	16.7		50	16.7	0
All Primary	10	10	50		20	10	0
Full Primary	0	0	66.7		33.3	0	0
Contributing Primary	25	25	25		0	25	0
Decile 8 – 10	4.8	23.8	42.9		14.3	14.3	0
Decile 4 – 7	4	28	24	4	20	16	4
Decile 1 - 3	5.9	11.8	41.2	5.9	35.3	0	5.9

Question 29 "When grouped by ability, those students in the lowest groups are motivated to learn"

School Type	Strongly agree	Agree	Tend to agree	3.5	Tend to disagree	Disagree	Strongly disagree
All Schools	6	29.9	41.8	7.5	11.9	3	0
All Secondary	2.5	30	42.5	5	17.5	2.5	0
Secondary > 900	6.3	18.8	50		18.8	6.3	0
Secondary < 900	0	34.8	43.5	8.7	13	0	0
All Intermediate/Middle	11.1	33.3	33.3	11.1	5.6	5.6	0
Intermediate/Middle > 500	9	45.5	18.2	9	9	9	0
Intermediate/Middle < 500	14.3	14.3	42.9	4.3	0	0	0
All Primary	10	30	40	10	10	0	0
Full Primary	0	33.3	33.3	16.7	16.7	0	0
Contributing Primary	25	25	50		0	0	0
Decile 8 – 10	4.8	33.3	52.4		9.5	0	0
Decile 4 – 7	0	33.3	37	14.8	11.1	3.7	0
Decile 1 - 3	16.7	22.2	38	5.6	16.7	5.6	0

Questions 30a – 30e. Some reasons for students' low achievements could be:

"poor attitude toward schooling in general"

School Type	Strongly agree	Agree	2.5	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	10.3	47.1	1.5	30.9	4.4	4.4	1.5
All Secondary	9.8	51.2		26.8	4.9	7.3	0
Secondary > 900	6.3	50		31.3	6.3	6.3	0
Secondary < 900	12.5	50		24	4.2	8.3	0
All Intermediate/Middle	16.7	38.9	5.6	27.8	5.6	0	5.6
Intermediate/Middle > 500	18.2	36.4		27.3	9	0	9
Intermediate/Middle < 500	14.3	42.9	14.3	28.6	0	0	0
All Primary	0	50		50	0	0	0
Full Primary	0	33.3		66.7	0	0	0
Contributing Primary	0	75		25	0	0	0
Decile 8 – 10	4.5	40.9		40.9	4.5	4.5	4.5
Decile 4 – 7	18.5	44.4		25.9	7.7	3.8	0
Decile 1 - 3	5.3	57.9	5.3	26.3	0	5.3	0

'poor attitude toward mathematics in particular"

School Type	Strongly agree	Agree	2.5	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	7.5	32.8	1.5	34.3	16.4	6	1.5
All Secondary	7.3	24.4		41.5	19.5	7.3	0
Secondary > 900	6.3	18.8		50	18.8	6.3	0
Secondary < 900	8.3	29.2		33.3	20.8	8.3	0
All Intermediate/Middle	5.6	50	5.6	27.8	5.6	0	5.6
Intermediate/Middle > 500	9	45.5		27.3	9	0	9
Intermediate/Middle < 500	0	57.1	14.3	28.6	0	0	0
All Primary	10	30		20	20	20	0
Full Primary	0	33.3		33.3	33.3	0	0
Contributing Primary	25	25		0	0	50	0
Decile 8 – 10	4.8	33.3		432.9	9.5	4.8	4.8
Decile 4 – 7	7.4	40.7		33.3	11.1	7.4	0
Decile 1 - 3	11.1	22.2	5.5	22.2	33.3	5.5	0

"maths anxiety"

School Type	Strongly agree	Agree	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	4.5	36.4	40.9	13.6	4.5	0
All Secondary	5.1	30.8	51.3	10.3	2.6	0
Secondary > 900	7.1	28.6	42.9	14.3	7.1	0
Secondary < 900	4.3	33.3	50	12.5	0	0
All Intermediate/Middle	5.6	55.6	27.8	11.1	0	0
Intermediate/Middle > 500	9	54.5	27.3	9	0	0
Intermediate/Middle < 500	0	57.1	28.6	14.3	0	0
All Primary	0	20	40	20	20	0
Full Primary	0	16.7	50	33.3	0	0
Contributing Primary	0	25	25	0	50	0
Decile 8 – 10	9.1	31.8	50	4.5	4.5	0
Decile 4 – 7	4	48	28	16	4	0
Decile 1 - 3	0	26.3	47.4	21.1	5.3	0

"chronic truancy"

School Type	Strongly agree	1.5	Agree	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	16.9	1.5	43.1	21.5	6.2	9.2	1.5
All Secondary	10	2.5	47.5	25	5	7.5	2.5
Secondary > 900	18.8		50	12.5	0	12.5	6.3
Secondary < 900	8.3	4.3	41.7	33.3	8.3	4.3	0
All Intermediate/Middle	23.5		41.2	7.6	11.8	5.9	0
Intermediate/Middle > 500	30		30	10	20	10	0
Intermediate/Middle < 500	14.3		42.9	28.6	0	0	0
All Primary	25		37.5	12.5	0	25	0
Full Primary	20		40	20	0	20	0
Contributing Primary	33.3		33.3	0	0	33.3	0
Decile 8 – 10	5.3		31.6	26.3	10.5	21.1	5.3
Decile 4 – 7	37		48	11.1	3.8	0	0
Decile 1 - 3	0	5.5	50	33.3	5.5	11.1	0

"frequent changes of school"

School Type	Strongly agree	Agree	Tend to agree	Tend to disagree	Disagree	Strongly disagree
All Schools	10.4	44.8	29.9	9.5	6	1.5
All Secondary	5	40	35	10	7.5	2.5
Secondary > 900	6.7	40	26.7	13.3	6.7	6.7
Secondary < 900	8.7	39.1	39.1	4.3	8.7	0
All Intermediate/Middle	5.6	61.1	27.8	5.6	0	0
Intermediate/Middle > 500	10	40	40	10	0	0
Intermediate/Middle < 500	0	87.5	12.5	0	0	0
All Primary	30	50	10	0	10	0
Full Primary	33.3	66.7	0	0	0	0
Contributing Primary	25	25	25	0	25	0
Decile 8 – 10	4.8	23.8	38.1	14.3	14.3	4.8
Decile 4 – 7	19.2	53.8	19.2	7.7	0	0
Decile 1 - 3	0	57.9	36.8	0	5.3	0