Exploring Issues in
Mathematics Education

Patterns of Performance and Progress on the Numeracy Projects 2001–2003: Further Analysis of the Numeracy Project Data

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Executive Summary

The Numeracy Projects are part of a key government initiative aimed at raising student achievement in mathematics by building teacher capability in mathematics teaching. Five projects are included: the Early Numeracy Project (Years 0–3), the Advanced Numeracy Project (Years 4–6), the Intermediate Numeracy Project (Years 7–8), the Secondary Numeracy Project (Years 9–10), and Te Poutama Tau (a Numeracy project for students taught in Māori medium settings).

The first four projects, which began in 2001, were informed by two pilot studies undertaken in 2000: the Count Me In Too Pilot Study at the year 0–3 level, and the Numeracy Exploratory Study at the year 4–6 level. Te Poutama Tau began in 2002.

Several key features characterise the Numeracy Projects. One is the Number Framework, established to help teachers, parents, and students to understand the requirements of the Number strand of the New Zealand mathematics curriculum (*Mathematics in the New Zealand Curriculum*). The framework makes a distinction between *strategy* and *knowledge*. The strategy section, which consists of a sequence of global stages, describes the mental processes students use to solve problems with numbers. The knowledge section describes key pieces of knowledge that students need to learn in order to be able to use strategies effectively. The two components are seen as interdependent, with strategy creating new knowledge through use, and knowledge providing the foundation upon which new strategies are built.

Another key component of the Numeracy Projects is the Diagnostic Interview, an assessment tool designed to provide teachers with quality information about their students' number knowledge and mental strategies. The Diagnostic Interview consists of an individual task-based interview with each student to determine his/her place on the Number Framework.

The third key aspect of the Numeracy Projects is the professional development programme for teachers. The programme consists of a combination of workshops and in-school support to help teachers to become familiar with the Number Framework, the Diagnostic Interview, and with ways to address the learning needs of their students in numeracy.

Early in the professional development programme, teachers are trained in the use of the Diagnostic Interview, and baseline data on their students is forwarded to a secure web-site for use by the project evaluators. At the end of the professional development programme, teachers again assess their students individually using the Diagnostic Interview and forward the data to the web-site. The data is used by the project evaluators as part of a systematic evaluation process for each of the five projects. Over the period 2001 to 2003, data on more than 200,000 students was forwarded to the web-site. This data has provided a unique opportunity to look more closely at the impact of the Numeracy Projects on students' mathematics learning.

This report focuses on the data collected by teachers working in primary schools where English is the medium of instruction. It includes data from the Early Numeracy Project, the Advanced Numeracy Project, and the Intermediate Numeracy Project. The research on which this report is based addressed one major question:

- How do patterns of performance and progress for students vary as a function of gender, ethnicity and socio-economic status?

Key Findings

- All students benefited from participation in the Numeracy Projects, regardless of ethnicity, gender, and socio-economic status. However, the relative differences between subgroups were virtually identical at the end of the project. The gap was widened rather than narrowed.

- Students who participated in one of the projects in 2001 did slightly better than those who participated in 2002 or 2003. There are several possible reasons for this pattern.

- Asian and European/Pākehā students began the project at higher stages on the number framework than Māori and Pasifika students, and benefited more from participation in the project than Māori and Pasifika students, hence the "achievement gap" was widened by the projects, rather than narrowed. This is the so-called "Matthew Effect," with the rich getting richer and poor getting poorer (relatively speaking).

- Girls who began the projects at lower framework stages appeared to make slightly better progress than boys who began at the same stage, but the opposite pattern was found at higher framework stages, with more boys progressing to a higher stage than girls.

- Students at high decile schools started the projects at higher framework stages than those at low and medium decile schools, and made larger gains over the course of the projects.

- Ethnicity, gender, and school decile level had a combined effect on students' performance and progress. For example, being Māori, being a girl, and attending a low decile school was more disadvantageous than any one of those factors on its own.

- Analysis of the patterns of progress showed that even when starting point was taken into account, European/Pākehā and Asian students made greater progress on the framework than Māori or Pasifika students over the course of the project.

Recommendations

It is recommended that, within the scope of the Numeracy Projects, the Ministry seeks to:

- ensure that further Numeracy Project facilitation encourages and supports teachers to find ways of more effectively meeting the mathematics learning needs of Māori and Pasifika students;

- encourage schools to strengthen home–school partnerships to support parents, whanau and others in the community to support the learning of their children;

- explore ways of sustaining the Numeracy Projects over time, including the recruitment and training of facilitators, particularly Māori or Pasifika.

Introduction

The last decade or so has seen major reforms in mathematics education across the world (see Acquarelli & Mumme, 1996; Ball, 1996; Department for Education & Employment, 1999; Department of Education, Training & Youth Affairs, 2000; Ministry of Education, 2001a–d; National Council of Teachers of Mathematics, 2000; Peterson & Barnes, 1996). In many countries, numeracy has become the focus rather than mathematics (eg, UK, Australia, NZ). Over the last decade or so, mathematics education has moved away from the idea of mathematics as the preserve of the intellectually elite, to the idea of "mathematics for all" (eg, Abrantes, 2001; Allexsaht-Snider & Hart, 2001; Croom, 1997; Davis, 2001; Gates & Vistro-Yu, 2003; Malloy, 1997; Wheeler, 2001). This perspective views understanding of mathematics as a key aspect of the preparation of students to take part fully within a democratic society.

Curriculum Update 45 (*The Numeracy Story*) (2001) outlines developments in mathematics education in New Zealand over a ten-year period between 1992 and 2001, beginning with the publication of the mathematics curriculum document, *Mathematics in the New Zealand Curriculum* (Ministry of Education, 1992). Another notable event in the history of New Zealand mathematics education was the publication of results from the Third International Mathematics and Science Study (TIMSS) showing relatively low levels of mathematics achievement for New Zealand children compared to those in many other countries (see Chamberlain, 2002; Chamberlain & Walker, 2001; Garden, 1996, 1997, 1998). In 1998, the Ministry of Education began work on a comprehensive numeracy policy and strategy for New Zealand. The *Feed the Mind/Whangaihia te Hinengaro* campaign was launched by the Ministry in 1999, to encourage families to support their children's literacy and numeracy development using ordinary everyday experiences. In 2000, the National Administration Guidelines (NAGs) were modified, requiring schools to give priority to numeracy as well as literacy (Ministry of Education, 2000a). Also in that year, two pilot projects were undertaken to improve teachers' professional knowledge, skills and confidence in mathematics (the *Count Me In Too* pilot project for students in years 1–3, and the *Numeracy Exploratory Study* for students in years 4–6) (see Higgins, 2001; Thomas & Ward, 2001). These two projects provided valuable information for the next phase of project development, the Numeracy Projects (NP), which began in 2001 (see Higgins, 2002; Thomas & Ward, 2002).

The Numeracy Projects are part of a key government initiative in mathematics education in New Zealand, and have been designed to raise student achievement in mathematics at every level of the education system. The projects sit within the Ministry of Education's Literacy and Numeracy Strategy, and address the first two of three key themes underpinning that strategy: clarifying expectations about learners' achievements, developing professional capability, and developing community capability. The projects are: the Early Numeracy Project (ENP: Years 0–3), the Advanced Numeracy Project (ANP: Years 4–6), the Intermediate Numeracy Project (INP: Years 7–8), the Secondary Numeracy Project (SNP: Years 9–10), and Te Poutama Tau (TPT: a Numeracy Project for students taught in Māori-medium settings) (see Christensen, 2003). The four English-medium projects began in 2001, followed by Te Poutama Tau in 2002.

Several important features characterise the Numeracy Projects. One important feature is the *Number Framework*, established to help teachers, parents, and students to understand the requirements of the Number strand of the New Zealand

mathematics curriculum (see Appendix A). The framework makes a distinction between *strategy* and *knowledge* (see Ministry of Education, 2004a). The strategy section, which consists of a sequence of global stages, describes the mental processes students use to solve problems with numbers. The knowledge section describes key pieces of knowledge that students need to learn in order to be able use strategies effectively. The two components are seen as interdependent, with strategy creating new knowledge through use, and knowledge providing the foundation upon which new strategies are built.

Another important component of the Numeracy Projects is the *Diagnostic Interview*, an assessment tool designed to provide teachers with quality information about their students' knowledge and mental strategies (see Ministry of Education, 2004b). The Diagnostic Interview consists of an individual task-based interview with each student to determine his/her place on the Number Framework for the various knowledge and strategy domains.

The third important aspect of the Numeracy Projects is the professional development programme for teachers. There are slightly different versions of this according to the age-group of the students involved. A combination of workshops, in-school support and modelling helps teachers to become familiar with the Number Framework, the Diagnostic Interview, and with ways to address the learning needs of their students in numeracy. Early in the professional development programme, teachers are trained in the use of the Diagnostic Interview, and then go on to interview each of their students individually, and forward this baseline data to a secure web-site for use by the evaluators. At the end of the professional development programme, teachers again assess their students individually using the Diagnostic Interview and this data also is forwarded to the web-site. The data is then used by the project evaluators as part of a systematic evaluation process for each of the five projects. Over the period 2001 to 2003, data on more than 200,000 students was forwarded to the web-site. This data provides a unique opportunity to look more closely at the impact of the Numeracy Projects on students' mathematics learning.

Annual evaluations of the various Numeracy projects over each of the past four years have documented their effectiveness in improving students' achievement in number, both in English-medium and in Māori-medium settings (see Christensen, 2003; Higgins, 2001, 2002, 2003; Irwin, 2003; Irwin & Niederer, 2002; Thomas & Ward, 2001, 2002; Thomas & Tagg, in press; Thomas, Tagg & Ward, 2002, 2003). Overall, growth in numeracy has occurred for all students, irrespective of their age, gender, ethnicity and socio-economic status (as reflected in the decile level assigned to their school). In the first year of the project, the data was analysed in terms of number of stages gained from the beginning of the project to the end (Higgins, 2002; Thomas & Ward, 2002). Year 0–3 Māori students gained an average of 1.06 stages on Addition/Subtraction, compared with 1.10 for Pākehā/European, 1.09 for Asian, and 1.07 for Pasifika students (Thomas & Ward, 2002). The pattern was very similar for Year 4–6 students, with 0.64 stages gained on Addition/Subtraction for Māori, compared with 0.66 for Pākehā/European, 0.67 for Asian, and 0.60 for Pasifika students (Higgins, 2002). (Note that a different scale was used to assess the year 4–6 students so gain scores across the two projects are not comparable.)

It quickly became apparent that the framework stages did not constitute a linear scale, and students who began the project at lower stages on the framework were able to gain stages much more easily than those who began at higher stages. Using gain scores as a measure of improvement disguised the fact that Māori and Pasifika students made less progress than European and Asian students who had started at the same point on the framework. Because a greater proportion of Māori and Pasifika students began the project at lower stages on the framework, they should have gained more stages on average than Pākehā/European students if they were benefiting from the programme to the same degree as Pākehā/European and Asian

students. However, the fact that gains (in number of stages) were virtually identical, despite many Māori students beginning the project at lower stages on the framework, indicates that Māori and Pasifika students did not gain as much as they should have, relative to their starting point on the framework. Examining differences in the distributions of students over the various stages on the framework as a function of ethnicity, gender, and socio-economic status had the potential to provide a more telling picture.

In the second year of the projects (2002), when starting points were taken into account as well as gains, it became evident that once again Asian and Pākehā/European students had made greater gains than Māori and Pasifika students who started at the same framework stage (see Higgins, 2003). These findings point to the need to examine carefully the impact of the Numeracy Projects on students from different ethnic backgrounds and to identify any changes that are needed to the implementation of the projects for these groups.

The analyses undertaken for the project evaluations looked at single variables, such as ethnicity, gender, and socio-economic status, to ascertain whether or not particular student subgroups benefited from the programme (see Higgins, 2001, 2002, 2003; Irwin, 2003; Irwin & Niederer, 2002; Thomas & Ward, 2001, 2002; Thomas et al, 2002, 2003). These initial analyses did not consider the possibility that several variables might have a combined impact on students' progress; for example, being Māori and being a girl. Exploring differences in the distributions of students at the various stages on the framework as a function of some combination of ethnicity, gender, and socio-economic status could provide a more in-depth picture than the analysis of single variables.

Multi-method approaches have been used by the project evaluators, combining quantitative data analysis of students' assessment results with qualitative data collected using interviews and questionnaires with teachers, principals, and facilitators. These evaluations provide clear evidence of the effectiveness of the projects for students' mathematics learning, and teachers' professional knowledge, skills and attitudes. However, the quantitative data gathered as part of the diagnostic interviews and forwarded to the Ministry by teachers is useful, not just as a check on the effectiveness of each individual project, but also as a valuable source of information about the nature of students' mathematical thinking, as well as patterns of performance and progress across age and time.

The present study was designed to explore in more depth the patterns of performance and progress by students to see how these varied as a function of ethnicity, gender, socio-economic status (as reflected in school decile level), and age. A more detailed and coherent picture of students' mathematics learning over the course of the projects was obtained in this study than had been possible for the evaluations of the individual projects at the end of each year. Data from the three primary projects (ENP, ANP, INP) gathered between 2001 and 2003 is included in this report.

Method

This investigation examined the impact of the numeracy project on students' performance in mathematics.

Participants
Data on more than 200,000 students in years 1 to 8 (ENP, ANP, and INP) is included in this report. The composition of the cohort was approximately 60% NZ European (Pākehā), 20% Māori, 10% Pasifika, and 4% Asian (for more details, see Appendix B). The remaining 6% were from "other" ethnic groups.

Procedure
Data on students' number knowledge and strategies were gathered by their teachers using individual diagnostic (task-based) interviews (in 2002 & 2003, the Numeracy Project Assessment [NumPA]; in 2001, its predecessor). Students were assessed at the beginning of the professional development programme, and then again at the end. Schools forwarded their data to a secure website for later analysis by the project evaluators.

Research Question
The research on which this report is based addressed the following question:

- How do patterns of performance and progress for students vary as a function of gender, ethnicity and socio-economic status?

In order to answer this question, the study looked at two sets of outcome measures from the Numeracy Project data:

- (Absolute) Performance (Initial and Final Framework Stage)
- Patterns of Progress (Gains Relative to Initial Framework Stage)

The analysis explored these two sets of outcome measures as a function of ethnicity, gender and socio-economic status (school decile band). For the purposes of this study, school decile levels have been collapsed into three bands: Low Decile (deciles 1 to 3), Medium Decile (deciles 4 to 7), and High Decile (deciles 8 to 10). This allows comparisons to be made to other studies which have aggregated decile levels in a similar way, such as the National Education Monitoring Project (see Crooks & Flockton 2002a, 2002b; Flockton & Crooks, 1998) and the analysis of School Entry Assessment data (see Davies, 2001; Gilmore, 1998; Ministry of Education, 2001b).

Analysis
Data was analysed from the three primary projects separately, and together. These projects include the:

- Early Numeracy Project (ENP) for students in years 0-3
- Advanced Numeracy Project (ANP) for students in years 4-6
- Intermediate Numeracy Project (INP) for students in years 7-8

Findings: Patterns of Performance

The research on which this report is based set out to explore the impact of the numeracy project on students' numeracy learning by looking at both *absolute* (initial and final framework stage) and *relative* (final framework stage as a function of initial framework stage) performance on the strategy component of the number framework. The analysis explored these two outcome measures as a function of ethnicity, gender and socio-economic status (as reflected in school decile band). This part of the report focuses on Patterns of Performance (absolute performance). The next part focuses on Patterns of Progress (relative performance).

Absolute Levels of Achievement (Performance)

Figures 1 to 3 show the percentage of students at each framework stage on Addition/Subtraction for the three projects at the primary level: ENP, ANP, and INP, respectively (for further details, see Appendix C). The first of each pair of bars shows initial data (bars 1, 3 & 5), while the second of the pair shows final data (bars 2, 4 & 6). Initial and final data is presented for each of the years between 2001 and 2003. On each project in each year, there was an increase in the proportion of students at the upper stages of the number framework, and a corresponding decrease in the proportion who were at lower stages on the framework. Table 1 presents a summary which shows the increase in the proportion of students at stage 5 (Early Additive Part-Whole) and stage 6 (Advanced Additive Part-Whole) on the Number Framework for the three projects over three years. A comparison of percentages of students at each stage over the three-year period show that students in 2001 did a little better than those in subsequent years (2002 & 2003). Not only were there slightly more students at the upper stages on the framework in 2001 than in 2002 and 2003, but as Table 1 shows clearly, the increase in percentages of students at stages 5 and 6 from the beginning to end of the project was also greater.

One possible explanation for the decline in performance lies with the assessment tools used for the three projects. In 2001, ENP students were assessed using a different tool to determine their framework stage from that used in for ANP and INP students. In 2002, the Numeracy Project Assessment (NumPA) was introduced. It had the advantage of providing a common assessment tool for use across all projects, giving teachers three overlapping forms (A, B, and C) to choose from in order to cater for students with different competencies in mathematics. A series of strategy windows at the beginning of the diagnostic interview was designed to help teachers decide which assessment form was most appropriate for each student. The possibility of a ceiling effect operating in conjunction with the use of the strategy windows was suggested in 2003 (see Young-Loveridge, 2003). This suggestion was made because there were fewer students able to show stage 5 and stage 6 thinking in 2002 than in 2001. The use of strategy windows to choose which of the three forms to use meant that the opportunity to demonstrate certain kinds of thinking was limited by the particular form chosen. For example, on Form A, the highest global strategy stage that could be demonstrated was stage 4 (Advanced Counting). Form B allowed students to demonstrate up to stage 5 thinking (Early Additive Part-Whole). Only Form C included tasks designed to reveal stage 6 (Advanced Additive Part-Whole) thinking.

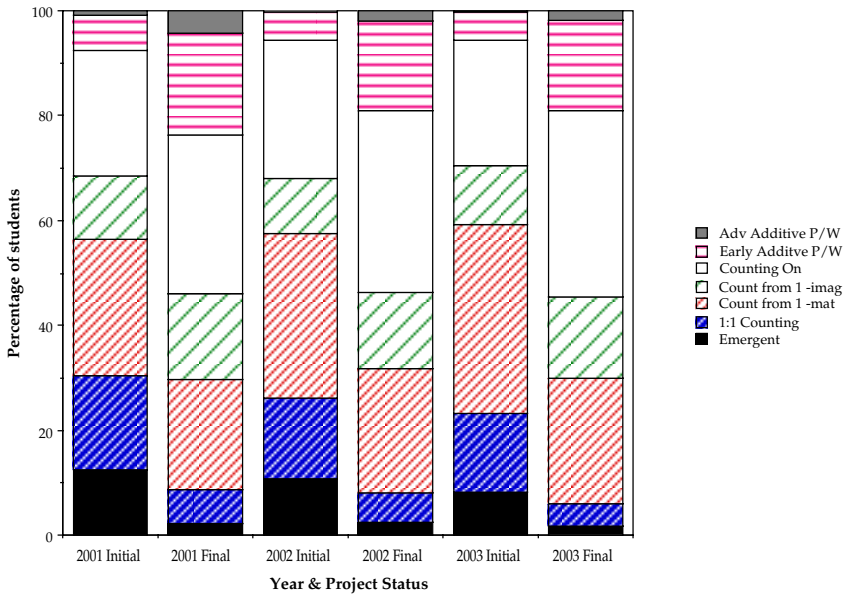

Figure 1. Percentage of ENP (Years 0-3) students at each framework stage on Addition/Subtraction at the beginning and end of the project 2001-2003

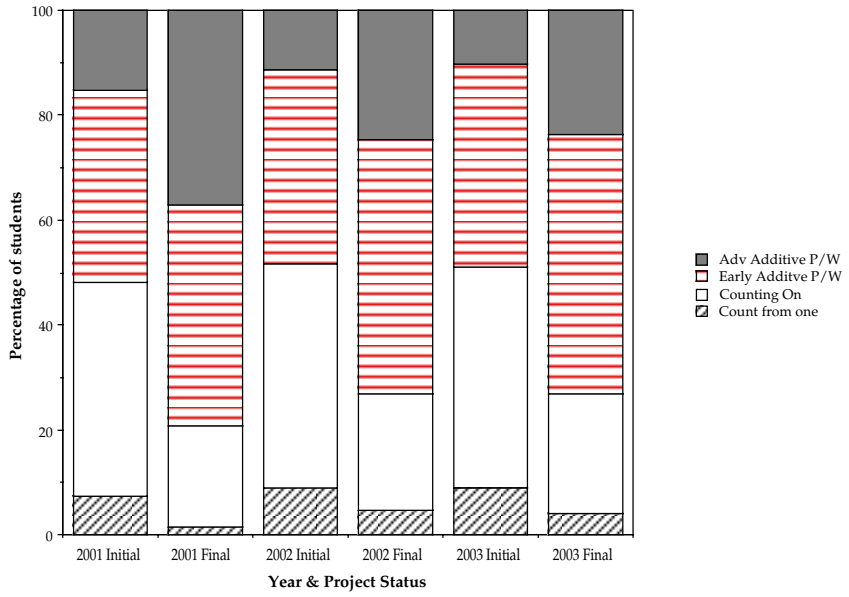

Figure 2. Percentage of ANP (Years 4-6) students at each framework stage on Addition/Subtraction at the beginning and end of the project 2001-2003

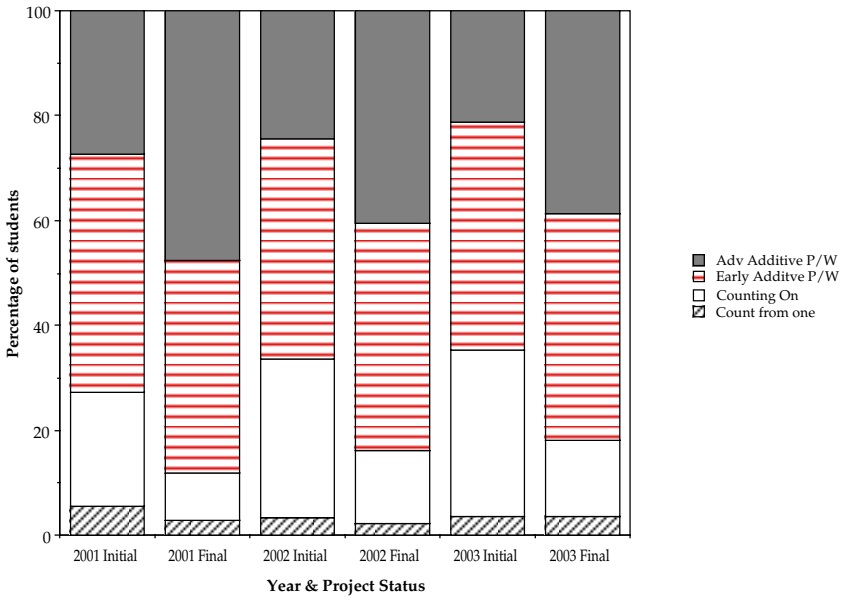

Figure 3. Percentage of INP (Years 7-8) students at each framework stage on Addition/Subtraction at the beginning and end of the project 2001-2003

Table 1

Increase in percentages of students at framework stages 5 to 8 from the beginning to the end of the project

		Year	
Stage	2001	2002	2003
Addition/Subtraction			
ENP (Years 0-3)	*(n=33203)*	*(n=20931)*	*(n=54962)*
Advanced Additive P/W	3.4	1.5	1.5
Total Part/Whole	16.3	11.1	13.6
ANP (Years 4-6)	*(n=8094)*	*(n=34036)*	*(n=55599)*
Advanced Additive P/W	21.7	13.2	13.4
Total Part/Whole	27.3	24.9	24.1
INP (Years 7-8)	*(n=1878)*	*(n=6241)*	*(n=12997)*
Advanced Additive P/W	20.1	16.1	17.7
Total Part/Whole	15.3	17.5	17.3

			Project			
Stage	ANP01	ANP02	ANP03	INP01	INP02	INP03
Multiplication/Division	*(n=8094)*	*(n=29767)*	*(n=50241)*	*(n=1878)*	*(n=6113)*	*(n=12646)*
Adv Multiplicative P/W	9.6	9.6	8.1	14.3	14.5	14.0
Adv Additive P/W	11.4	21.0	14.4	4.2	8.2	9.9
Total Part/Whole	25.5	26.9	27.1	10.4	17.9	18.6
Fractions/Ratios	*(n=8094)*	*(n=29587)*	*(n=49731)*	*(n=1878)*	*(n=6065)*	*(n=12552)*
Adv Proportional P/W	1.8	1.4	1.3	5.3	4.6	3.6
Adv Multiplicative P/W	7.0	7.2	6.9	5.9	9.3	9.3
Adv Additive P/W	10.5	11.0	11.5	6.0	8.5	8.7
Total Part/Whole	23.5	29.1	29.2	19.4	21.5	21.5

In 2003, the strategy windows were extended to include all of the Addition/Subtraction tasks, and this meant that all students were given the opportunity to show part-whole strategies for addition and subtraction problems. However, a further change to the Diagnostic Interview made in 2003, meant that it became harder to qualify as an Advanced Additive Part-Whole thinker. That almost certainly reduced the numbers of students reaching stage 6 on the framework for Addition/Subtraction in 2003. As Table 1 shows, the proportion of students who improved at stages 5 and 6 in 2003 was very similar to those found in 2002. Hence the reduction in the proportion of students at upper levels of the framework from 2001 to 2002 and 2003 could be explained by a ceiling effect operating in 2002, and by more stringent criteria applied in 2003.

Another possible reason for the reduction in numbers of students at upper stages of the Number Framework could be related to the characteristics of different cohorts of teachers involved in the projects at different stages of the implementation process. It seems likely that the teachers who were involved in the project initially were particularly motivated and committed. Many of these teachers came from schools that had been involved in one of the pilot projects in 2000. The teachers involved in the pilot phase had been invited to participate in the project by mathematics advisors/facilitators who knew that they had particular strengths and interests in mathematics learning and teaching. In subsequent years, there is likely to have been a greater proportion of teachers in the project with less commitment to mathematics learning and teaching than those involved in the project initially.

It is interesting to note that the percentage of students who were initially stage 0 (Emergent) has reduced over successive years. This can be explained by changes in the composition of the student cohort each year, with an increasing proportion of students from high decile schools (24.7%, 27.7%, 29.7% for ENP in 2001, 2002, & 2003, respectively).

The Impact of Student Ethnicity

At the Beginning of the Project (Initially)
Appendix C includes tables showing the percentages of students at each framework stage at the beginning and end of the project for all projects and years, and for various subgroups. Figures 4 and 5 present data on Addition/Subtraction from the 2002 ANP and INP projects (Appendix D includes figures showing corresponding data for Multiplication/Division & Fractions/Ratios). The first of each pair of bars shows initial data (In: bars 1, 3, 5, & 7), while the second of the pair shows final data (Fin: bars 2, 4, 6, & 8). Initially, the ethnic group with the greatest number of students at upper stages of the framework (shown by the bars with grey shading) and the least at lower stages (shown by the bars with a diagonal striped pattern) was Asian (As). The ethnic group with the next highest number of students at upper framework stages was European/Pākehā (Eu), followed by Māori (Ma). The group with the least students at the upper stages and the most students at lower stages was Pasifika (Pa). This pattern is consistent with those found in other studies of mathematics achievement, such as the Third International Mathematics and Science Study (see Garden, 1996, 1997, 1998), School Entry Assessment (see Davies, 2001; Gilmore, 1998; Ministry of Education, 2001b), and the National Education Monitoring Project (see Crooks & Flockton, 2002a, 2002b; Flockton & Crooks, 1998).

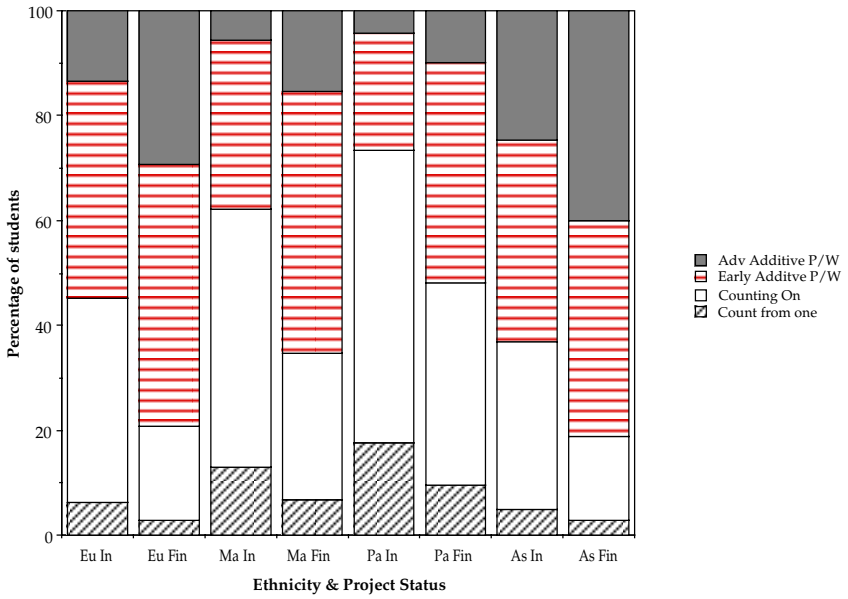

Figure 4. Percentages of ANP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

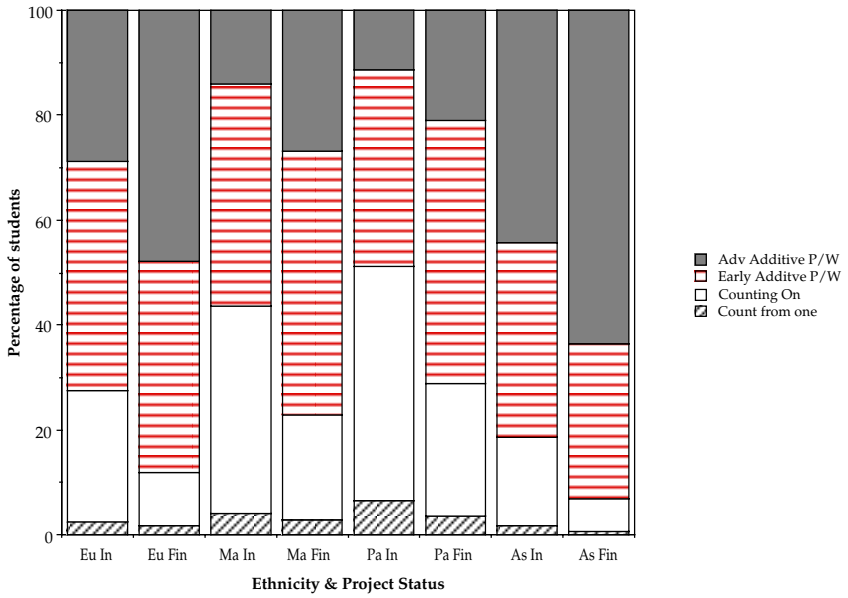

Figure 5. Percentages of INP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

At the End of the Project (Finally)
As Figures 4 and 5 show (see also Appendices C & D), at the end of the project, each ethnic group had the same rank order position as it had done initially. If anything, the differences between the four groups appeared to be even greater than they had been initially. Instead of narrowing the gap, the project appears to have widened it. Table 2 shows increases in the percentages of students at framework stages 5 and 6 for Addition/Subtraction. The pattern changes slightly with the age of students and the domain in question. Table 2 shows that, in the first three years of school, Māori and Pasifika students made the least progress in terms of increases in the percentages of students at the upper stages on the framework for Addition/Subtraction, whereas European/Pākehā and Asian students made the most progress. This pattern was found across all three years, 2001 to 2003.

In middle and upper primary school (ANP & INP), Māori and Pasifika students in ANP did more poorly at stage 6 (Advanced Additive Part-Whole) than did their Asian and Pākehā counterparts. However, when stage 5 was included also (as in Total Part-Whole), the proportion of Māori and Pasifika students was the same or greater than that of Asian or Pākehā students. The data suggest that for Māori and Pasifika students, the most significant transition was from Advanced Counting to Early Additive Part-Whole, whereas for Asian and Pākehā students, the most significant transition was from Early to Advanced Additive Part-Whole. As Appendix C shows, there appears to have been a ceiling effect operating for Asian and European students, many of whom started the project already at stage 6, and so had little or no room to make improvements.

On Multiplication/Division and Fractions/Ratios, a similar pattern is evident (see Appendix E). Māori and Pasifika students in ANP have smaller increases at stage 7 (Advanced Multiplicative Part-Whole) than the other two groups, Pasifika have smaller increases at stage 6 (Advanced Additive Part-Whole) than the other three groups, but when stages 5 to 7 were combined, the increases were comparable across all four groups. The patterns for INP students appear to have been affected by a ceiling effect operating for Asian and European students, many of whom started the project already at stage 7, so had little or no room to make improvements.

On Fractions/Ratios, a ceiling effect appears to have been operating for Asian students, but was less evident for Pākehā students. Increases in the percentages of Māori and Pasifika students were smaller at stages 7 (Advanced Multiplicative Part-Whole) and stage 8 (Advanced Proportional Part-Whole), but were comparable to that of the other two groups when all the Part-Whole stages were combined.

The Impact of Gender
Appendix C includes tables showing the percentages of students at each framework stage at the beginning and end of the project for all projects and years, and for various subgroups. Figures 6 and 7 present data on Addition/Subtraction from the ANP and INP projects from 2001 to 2003 (for corresponding figures showing Multiplication/Division and Fractions/ Ratios, see Appendix D). The first of each pair of bars presents data for boys (bars 1, 3, 5, 7, 9 & 11), while the second presents data for girls (bars 2, 4, 6, 8, 10 & 12). Data on the initial stage is presented, followed by data on the final stage. The first four bars present initial and final data for 2001, the second four for 2002, and the final four, for 2003. Initially, the group with the greater number of students at upper stages of the framework (grey shading) and the least at lower stages (diagonal stripes) was boys.

Table 2

Increase in percentages of students at framework stages 5 and 6 for Addition/Subtraction from the beginning to the end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Early Numeracy Project (Years 0-3)					
ENP 2001	*(n=19487)*	*(n=7676)*	*(n=3554)*	*(n=1363)*	*(n=33203)*
Advanced Additive P/W	3.9	2.5	1.0	6.0	3.4
Total Part/Whole	18.7	13.1	8.4	20.4	16.3
ENP 2002	*(n=12416)*	*(n=4576)*	*(n=2121)*	*(n=1004)*	*(n=20929)*
Advanced Additive P/W	1.8	1.1	0.1	3.1	1.5
Total Part/Whole	15.2	10.1	6.7	15.5	11.1
ENP 2003	*(n=32824)*	*(n=12304)*	*(n=5939)*	*(n=2820)*	*(n=56257)*
Advanced Additive P/W	1.9	1.0	0.3	3.1	1.6
Total Part/Whole	15.7	9.8	7.5	17.8	13.6
Advanced Numeracy Project (Years 4-6)					
ANP 2001	*(n=5139)*	*(n=1471)*	*(n=770)*	*(n=483)*	*(n=8094)*
Advanced Additive P/W	23.5	18.7	14.4	24.4	21.7
Total Part/Whole	26.4	31.9	30.5	19.9	27.3
ANP 2002	*(n=19600)*	*(n=8037)*	*(n=3193)*	*(n=1700)*	*(n=34035)*
Advanced Additive P/W	15.6	9.9	5.7	15.4	13.2
Total Part/Whole	24.2	27.5	25.5	18.4	24.9
ANP 2003	*(n=33878)*	*(n=13466)*	*(n=4903)*	*(n=2634)*	*(n=57316)*
Advanced Additive P/W	15.4	10.2	6.5	16.6	13.4
Total Part/Whole	23.5	26.8	24.2	17.6	24.1
Intermediate Numeracy Project (Years 7-8)					
INP 2001	*(n=1130)*	*(n=379)*	*(n=75)*	*(n=206)*	*(n=1878)*
Advanced Additive P/W	21.5	16.4	16.0	19.9	20.1
Total Part/Whole	14.6	23.7	20.0	5.3	15.3
INP 2002	*(n=3601)*	*(n=1690)*	*(n=566)*	*(n=312)*	*(n=6418)*
Advanced Part/Whole	19.0	12.7	9.5	19.3	16.1
Total Part/Whole	15.8	20.9	22.2	11.6	17.5
INP 2003	*(n=7173)*	*(n=3786)*	*(n=1405)*	*(n=599)*	*(n=13460)*
Advanced Additive P/W	20.5	14.1	11.9	22.6	17.7
Total Part/Whole	16.2	20.8	16.7	13.0	17.3

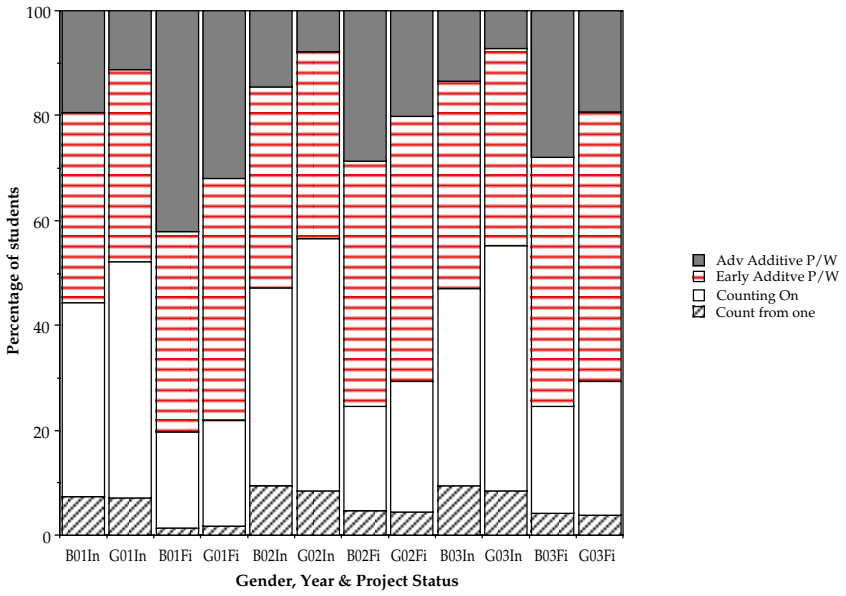

Figure 6. Percentages of ANP students at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Gender (2001-2003)

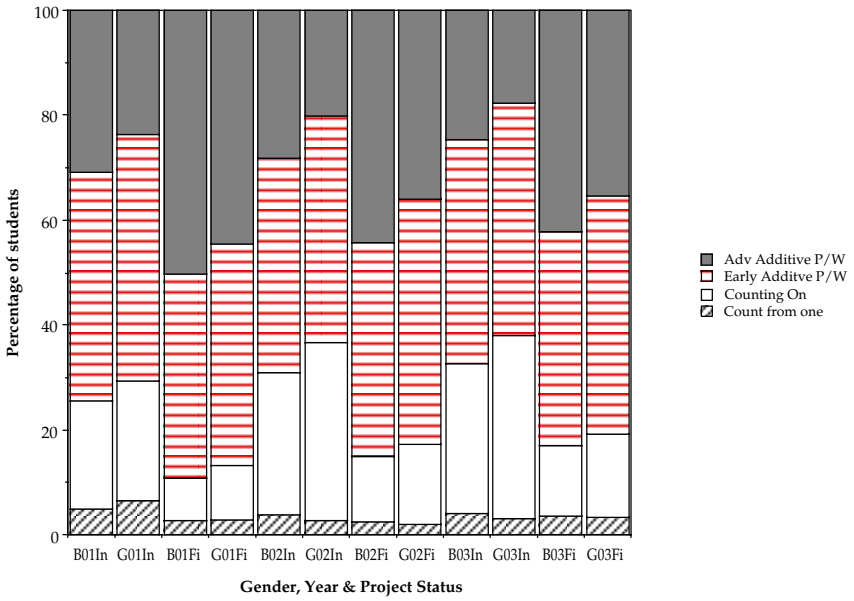

Figure 7. Percentages of INP students at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Gender (2001-2003)

At the end of the project, boys were still ahead of girls at the upper stages of the framework. Appendix E (Table E3) shows that boys' advantage was particularly marked at the highest stages of the framework, but was less evident when all part-whole stages were combined. Again a ceiling effect may have limited the improvements that boys could make at upper stages of the framework.

The Impact of School Decile Level

Appendix C includes tables showing the percentages of students at each framework stage at the beginning and end of the project for all projects and years, and for the three decile bands. Figures 8 and 9 present data from ENP and ANP for 2001 and 2002 (see Appendix E for tables, and Appendix D for figures showing patterns for Multiplication/Division and Fractions/Ratios). The first three bars show initial data (In) for 2001 (low, medium, & high Decile), and second three show final data (Fin). The final six bars show the corresponding data for 2002. It is clear from the tables and figures that at the beginning of the project, there were more students from high decile schools at the upper stages of the framework, and the group with the fewest students at the upper stages was the low decile group. At the end of the project, the rank order of the three decile bands was the same as it had been initially, and the gaps between adjacent decile bands appear to have widened.

The students at high decile schools seem to have benefited the most from the project, and those at low decile schools the least. There are many possible explanations for this pattern. One is that low decile schools (more than medium or high decile schools) have a great many issues to deal with in addition to the teaching and learning that happens in classrooms. For example, they often have to deal with the effects of poverty, disadvantage, and violence on their students. Hence the demands on teachers in low decile schools are often greater than on those in high and medium decile schools (Ritchie, 2004). It may be more difficult for the families of students in low decile schools to support and reinforce their children's school learning, not because they don't want to, but because many don't appreciate just how helpful they could be to their children's learning by building strong partnerships with their children's teachers (ie, they sometimes lack the cultural capital that families at medium and high decile schools take for granted) (Bordieu, 1997; Ritchie, 2004). Pupil transience is a factor often associated with low levels of achievement. Even though the students whose data is presented here continued to attend the same school over the course of the project, it seems likely that the transience of other pupils at their schools and in their classrooms may have a negative impact on their learning (see Smith & Swain, 1988 for a discussion about the importance of peer group stability for children's intellectual development in early childhood centres). There is also some evidence that teacher transience adversely affects children's learning (see Ritchie, 2004; Smith & Swain, 1988). Analysis of teachers' movements between schools show that teachers teaching in low decile schools in New Zealand have a tendency to move towards higher decile schools (Ritchie, 2004). This pattern is particularly marked for teachers with longer periods of service in the teaching profession. A consequence of this is likely to be that low decile schools have disproportionately more of the least experienced teachers, as well as having more changes of teacher. However, there are some exceptions to this pattern, as anecdotal evidence has shown. Understanding more about those exceptions could provide valuable information for use in schools with high levels of teacher transience to achieve more stability in staffing.

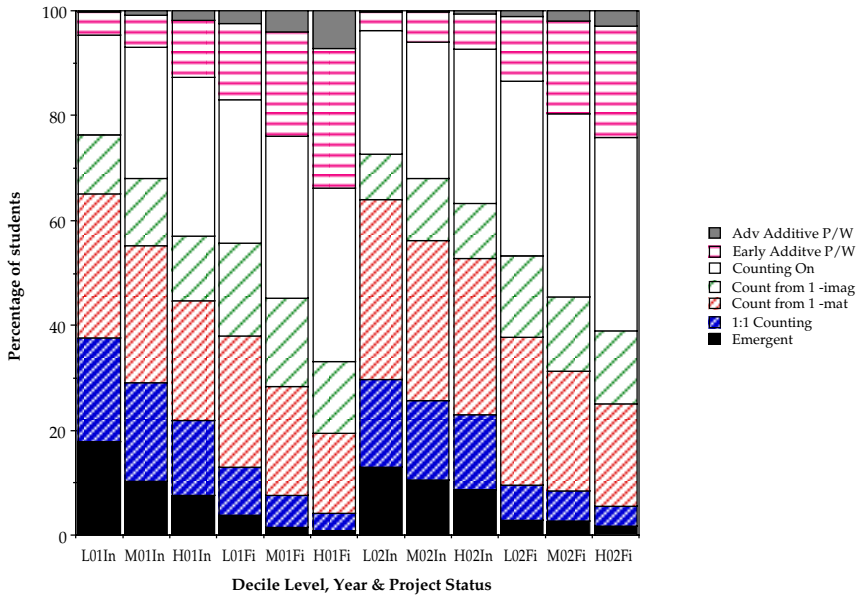

Figure 8. Percentages of ENP students at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Decile (2001 & 2002)

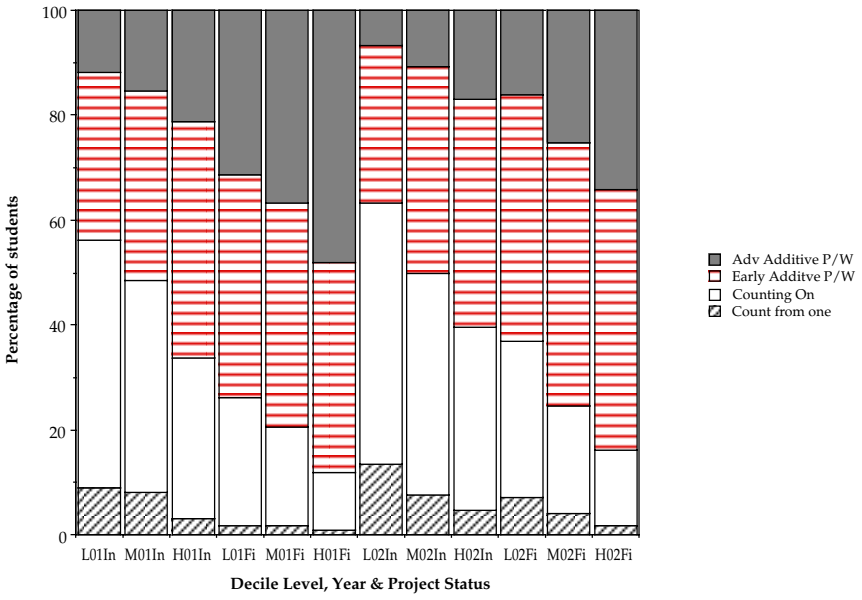

Figure 9. Percentages of ANP students at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Decile (2001 & 2002)

Combined Effects of Ethnicity, Gender, and Decile Band
Appendix C includes tables showing the percentages of students at each framework stage at the beginning and end of the project for all projects and years, for combinations of variables, such as ethnicity and gender, gender and decile, and decile and ethnicity (see also figures in Appendix D).

Ethnicity and Gender
Appendix E shows the increase in percentages of students at upper stages on the number framework as a function of ethnicity and gender. This analysis was done in order to consider the possibility of several variables having a combined impact on students' progress. For example, the analysis explored whether being Māori and being a girl was more disadvantageous than just being Māori, or just being a girl (eg, see Table 2 and Tables E1 and E2). It appears from the data that gender and ethnicity do combine to further advantage or disadvantage students. Boys tend to do better than girls, European/Pākehā tend to do better than Māori and Pasifika students. Hence, Māori girls are the worst off while European/Pākehā boys are the best off.

Gender and Decile
Appendix E shows the increase in percentages of students at upper stages on the number framework as a function of gender and decile. School decile and gender had a combined effect on students' progress. For example, being a girl and being at a low decile school was more disadvantageous than just being a girl, or just being at a low decile school (eg, see Table 2). Hence, girls at low decile schools were the worst off while boys at high decile schools were the best off.

Decile and Ethnicity
Appendix E shows the increase in percentages of students at upper stages on the number framework as a function of decile and ethnicity. Socio-economic status (as reflected in school decile) and ethnicity appear to have had a combined effect on students' progress. For example, being Māori and being at a low decile school was more disadvantageous than just being Māori or just being at a low decile school (eg, see Table 2).

By the end of the project, Māori in high decile schools were doing better than European students in low deciles schools (see ENP data in 2001 and 2001 presented in Appendix C). Among the younger children (in ENP), Asian students in low decile schools outperformed Māori in high decile schools, but this pattern was not evident with older children (see ANP data in 2002 in Appendix C).

A major problem with this analysis was that certain decile bands included disproportionately low numbers of certain ethnic groups. For example, there were relatively few Asian students at low decile schools, and relatively few Pasifika students at high decile schools. Ceiling effects seemed to have affected the performance of students at high decile schools more than those at low decile schools, so interpretation of the change in percentages at the upper stages of the framework needs to take this into account.

Findings: Patterns of Progress

Patterns of Progress were analysed to explore the impact of ethnicity, gender and socio-economic status (as reflected in school decile level) on students' performance relative to their starting points on the number framework. Appendix F shows the percentages of students who progressed to a higher stage as a function of initial stage on the framework and ethnicity. Small numbers of students from some ethnic groups starting the project at higher stages on the framework (ie < 30) made this analysis difficult. For this reason, data on patterns of progress was aggregated over years 0 to 8. (Note: for Addition/Subtraction, data for stages 0 to 3 was aggregated into a single level because so few of the older students were below stage 3.)

The Impact of Student Ethnicity

Figure 10 shows the percentages of year 0 to 8 students in 2002 who progressed to a higher framework stage for Addition/Subtraction as a function of initial stage and ethnicity. The first four bars show patterns of progress for students from the four main ethnic groups who began the project at stage 3 (Counting from One). The second four bars show the progress of Advanced Counters (stage 4), and the final four bars show the corresponding patterns for those who started the project at stage 5 (Early Additive Part-Whole). As Figure 10 shows, when the initial stage was held constant, Pākehā/European and Asian students made the most progress, and Māori and Pasifika students the least (see Appendix D for figures showing patterns of progress as a function of ethnicity for other operational domains). Figure 10 shows also that it was more difficult for students to progress beyond stage 5 (Early Additive Part-Whole), than if they had started the project at one of the counting stages (stages 3 or 4). This was a consistent pattern evident in all of the figures showing patterns of progress as a function of initial stage. Figure 11, presenting the corresponding data for 2003, shows a pattern which is consistent with the 2002 data.

The Impact of Student Gender

Figure 12 shows the percentage of year 0 to 8 students in 2003 who progressed to a higher framework stage for Addition/Subtraction as a function of initial framework stage and gender. At lower starting points on the framework (ie counting from one), girls appear to have made similar progress to boys. However, of those students who began the project at stage 4 (Advanced Counting), or stage 5 (Early Additive Part-Whole), more boys progressed to stage 6 (Advanced Additive Part-Whole) than did girls. Table 3 shows the values of Chi Squared and their associated probability values (if statistically significant) for gender differences. As Table 3 clearly shows, there were statistically significant gender differences at virtually every starting point for each domain in both years (2002 & 2003). Although Fractions in 2002 showed no significant gender difference for students starting at stage 3 (Counting from one) and stage 7 (Advanced Multiplicative Part-Whole), there were statistically significant differences at stages 4 through 6. Gender differences were even more marked in 2003 than they had been in 2002.

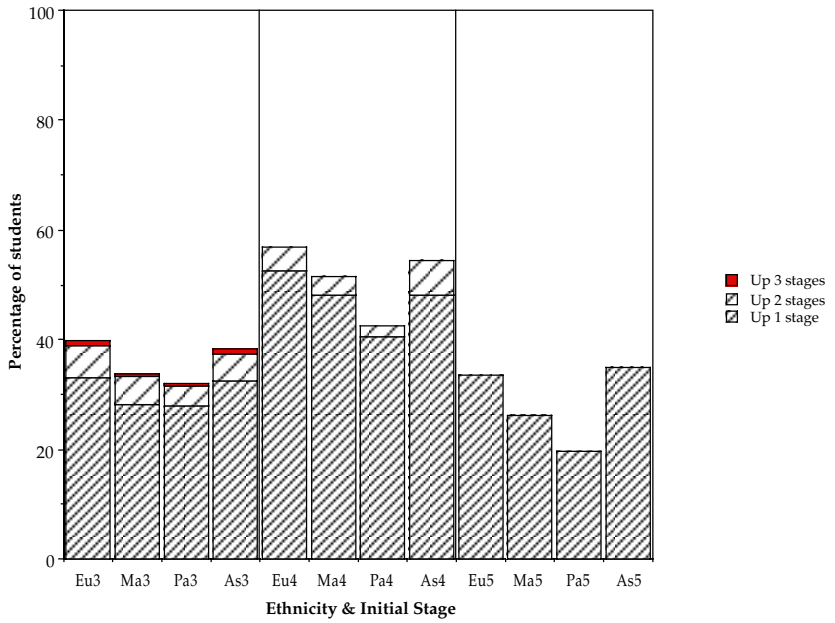

Figure 10. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for Addition/Subtraction as a function of Initial Stage & Ethnicity

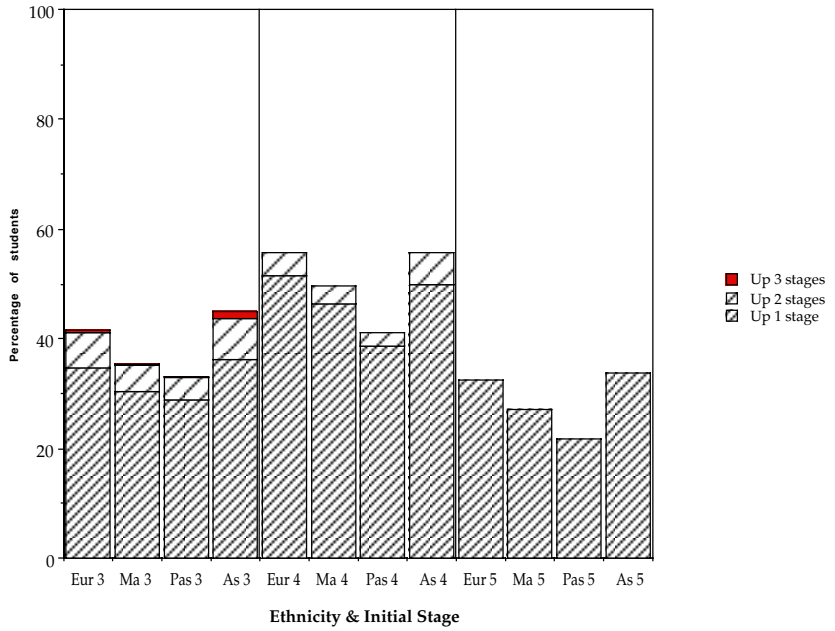

Figure 11. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for Addition/Subtraction as a function of Initial Stage & Ethnicity

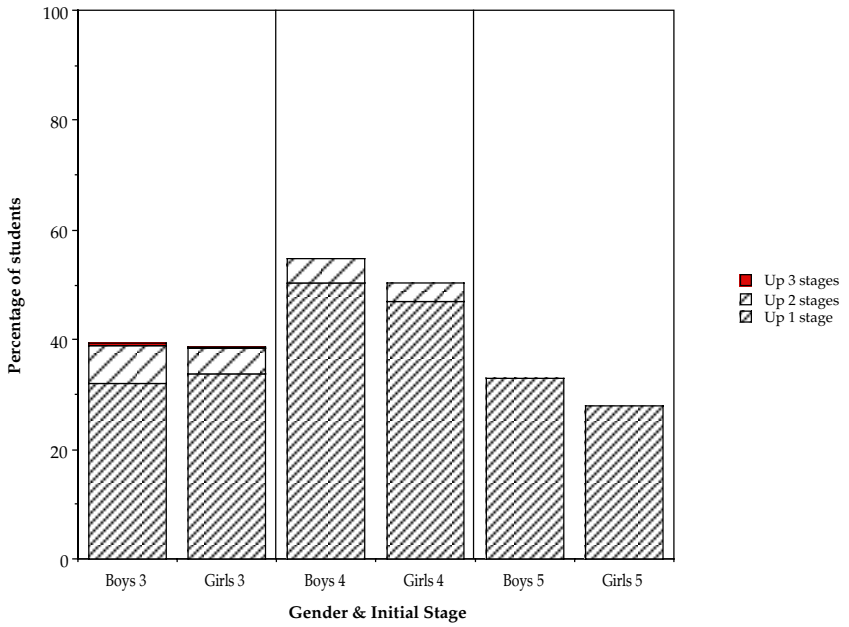

Figure 12. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for Addition/Subtraction as a function of Initial Stage & Gender

Table 3

Value of Chi Squared and associated probability value (if significant) for Gender Differences on Progress for Years 0-8 students in 2002 and 2003

	2002		2003	
Initial Stage	Chi Sq	Prob	Chi Sq	Prob
Addition/Subtraction				
3. Count from one	31.05	***	106.41	***
4. Advanced Counting	16.46	**	91.93	***
5. Early Additive P/W	32.02	***	91.21	***
Multiplication/Division				
3. Count from one	24.25	***	51.31	***
4. Advanced Counting	31.90	***	87.31	***
5. Early Additive P/W	18.84	**	46.42	***
6. Adv Additive P/W	13.03	**	35.52	***
Fractions				
3. Count from one	9.45		20.18	**
4. Advanced Counting	23.37	***	50.39	***
5. Early Additive P/W	17.55	**	34.98	***
6. Adv Additive P/W	22.96	***	24.64	***
7. Adv Multiplicative P/W	1.14		2.89	

Statistical Significance

* $p < .05$

** $p < .01$

*** $p < .001$

Combined Effects of Gender and Ethnicity

Figures 13 and 14 present the patterns of progress on Addition/Subtraction as a function of ethnicity and gender for each initial stage in 2002 (Figure 13 presents the patterns for European and Māori students, Figure 14 presents the patterns for Pasifika and Asian students). Figures 15 and 16 present the corresponding data for students in 2003. Appendix G presents the values of Chi Squared and their associated probability values (if statistically significant). It is clear from Appendix G that European students showed the greatest gender differences, and these were statistically significant for all three initial stages. There were also significant gender differences for Māori, but only at stage 3 (Counting from one) and stage 5 (Early Additive Part-Whole). There were no significant gender differences for Pasifika and Asian students in 2002, but a few differences were statistically significant in 2003. The only statistically significant gender differences on Multiplication/Division, and Fractions/Ratios in 2002 were for European students. In 2003, the pattern was similar, but several gender differences for Asian students reached statistical significance.

Combined Effects of Gender and School Decile Level

The aggregation of data across years 0 to 8 enabled an analysis to be done of gender differences as a function of school decile level. Figure 17 shows the percentage of students who progressed to a higher framework stage for Addition/Subtraction as a function of initial stage, school decile, and gender in 2002. Figure 18 shows the corresponding pattern for students in 2003. Gender differences did not appear to vary systematically as a function of school decile level, although progress was greater the higher decile band, and the pattern was very similar in both years. The only pattern that seems to have varied as a function of school decile level can be seen in the Multiplication/Division data (see Table G3 in Appendix G). Significant gender differences for students in low decile schools were evident at lower stages on the framework, whereas those for students in high decile schools tend to occur at higher stages on the framework (see Table G3). The pattern for students at medium decile schools fell between that found for the low and high decile bands.

Impact of Gender on Multiplicative and Proportional Progress Patterns

Figures 19 through 22 present the patterns of progress for multiplication/division, and fractions/ratios in 2002 and 2003, respectively. Tables 3 through 5 shows the values of Chi Squared and their associated probability values (if statistically significant) for gender differences. There is a clear effect of gender on patterns of progress in multiplication/division and fractions/ratios apparent from stage 4 (Advanced Counting) onwards, with boys making significantly greater progress than girls. Only Fractions in 2002 showed no significant gender difference for students starting at stages 3 and 7. However, there were large, statistically significant gender differences for stages 4 through 6.

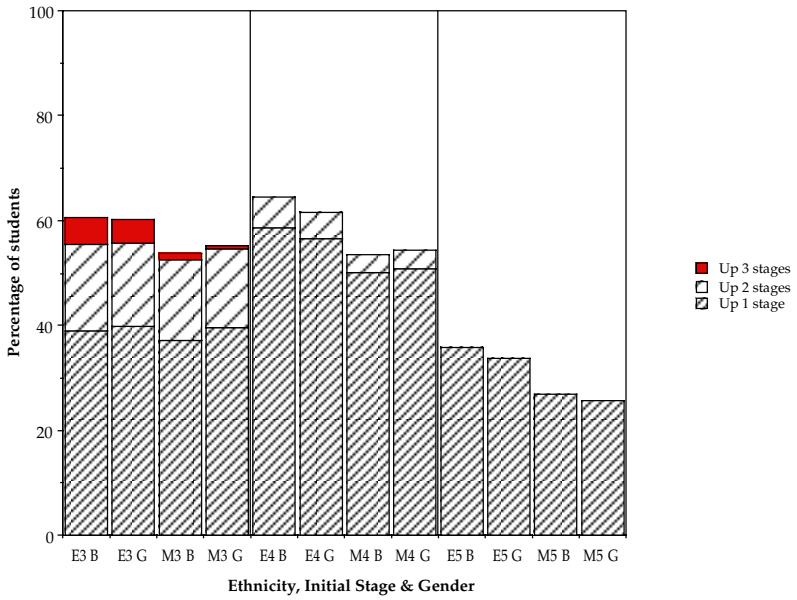

Figure 13. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for Addition/Subtraction as a function of Initial Stage, Ethnicity and Gender (European & Māori)

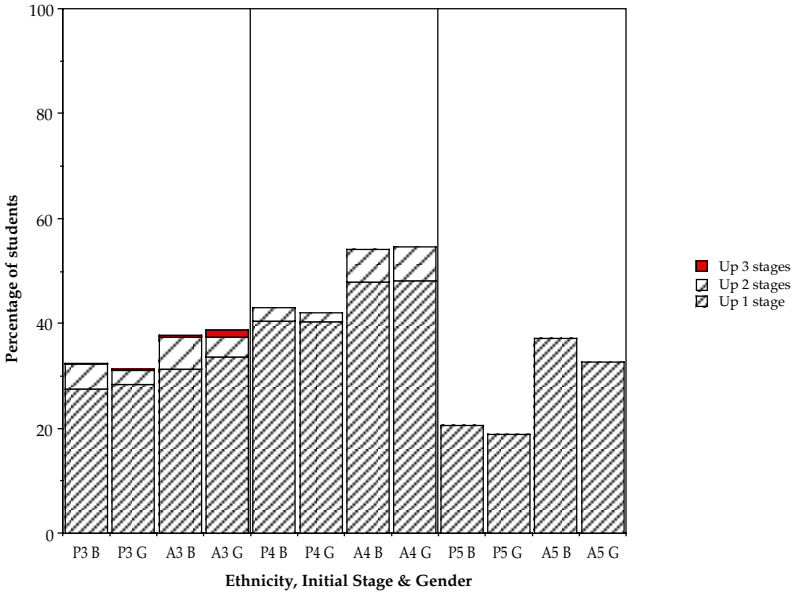

Figure 14. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for Addition/Subtraction as a function of Initial Stage, Ethnicity and Gender (Pasifika & Asian)

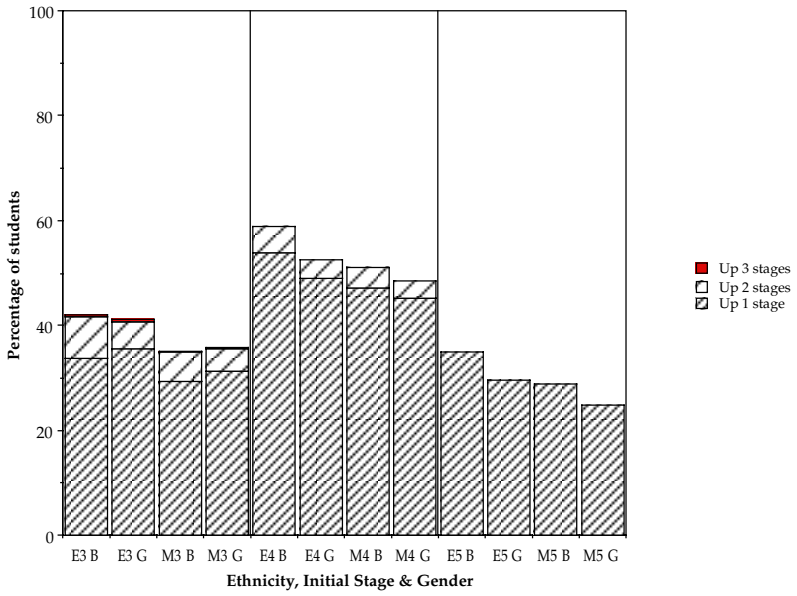

Figure 15. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for Addition/Subtraction as a function of Initial Stage, Ethnicity and Gender (European & Māori)

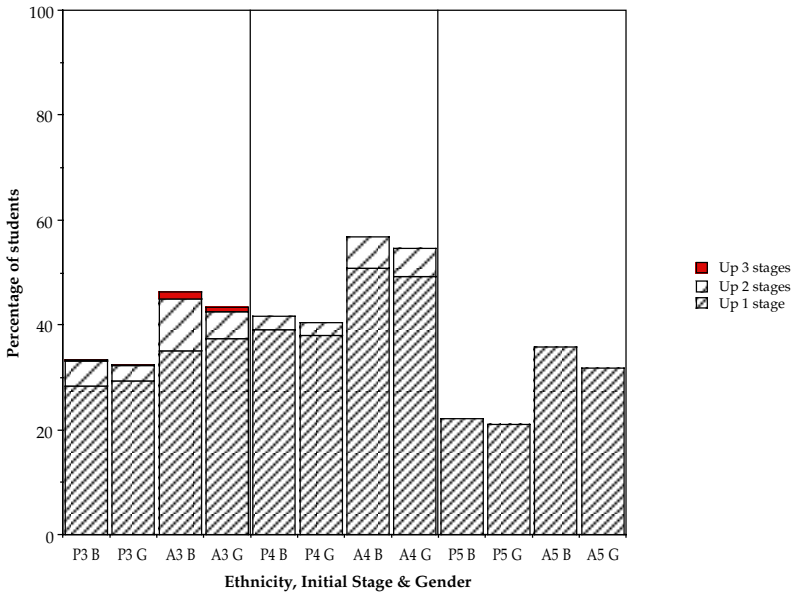

Figure 16. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for Addition/Subtraction as a function of Initial Stage, Ethnicity and Gender (Pasifika & Asian)

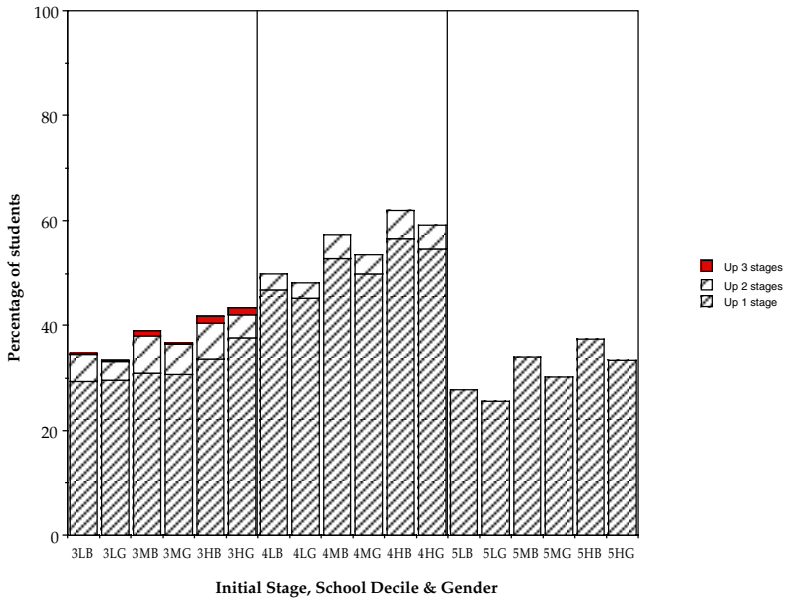

Figure 17. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage on Addition/Subtraction as a function of Initial Level, Decile and Gender

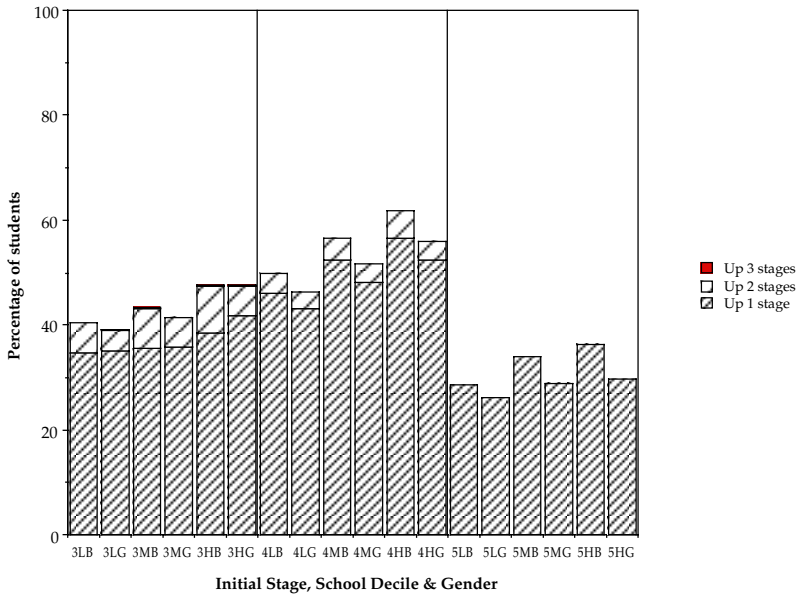

Figure 18. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage on Addition/Subtraction as a function of Initial Level, Decile and Gender

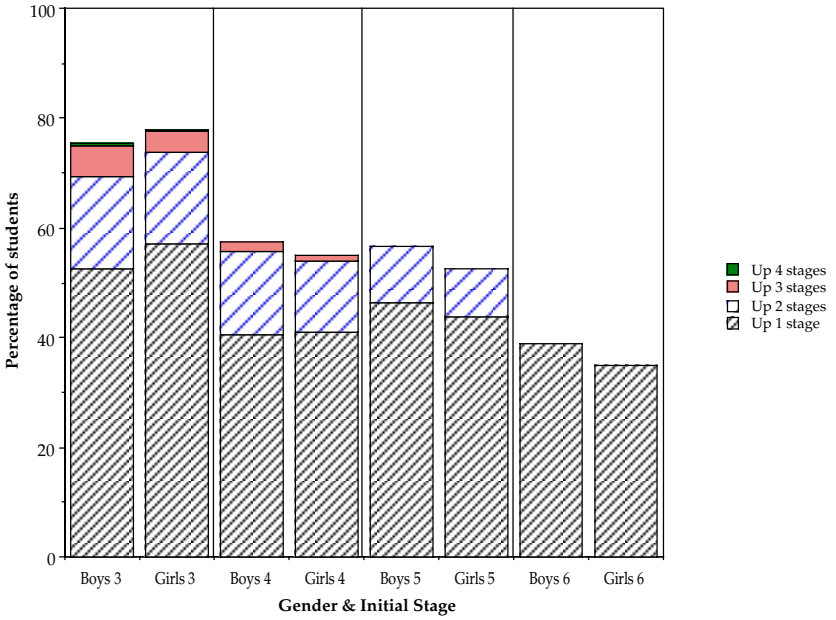

Figure 19. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for Multiplication/Division as a function of Initial Stage & Gender

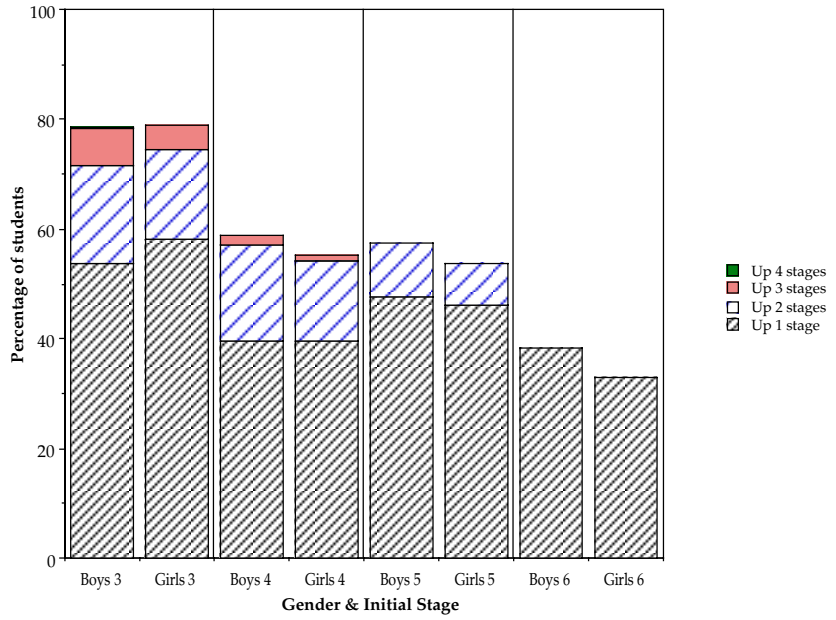

Figure 20. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for Multiplication/Division as a function of Initial Stage & Gender

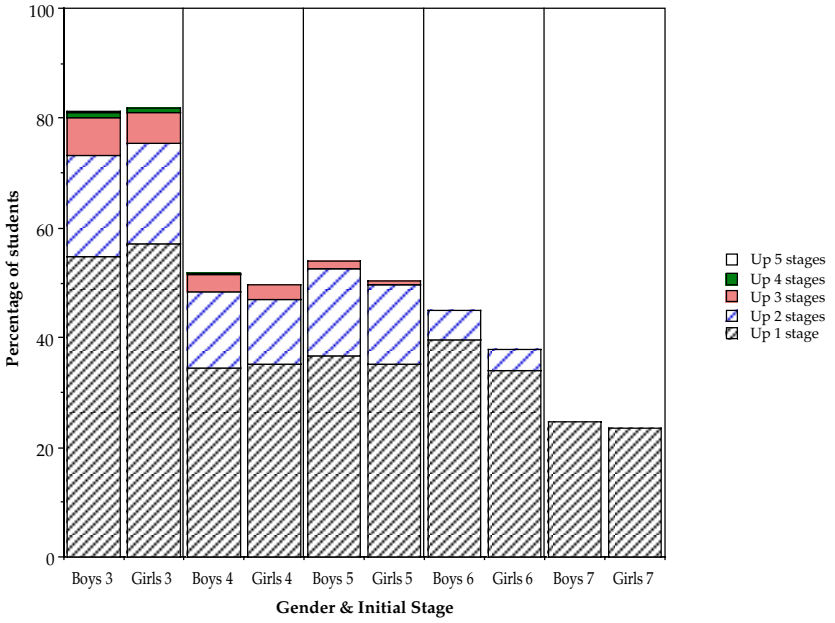

Figure 21. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for Fractions/Ratios as a function of Initial Stage & Gender.

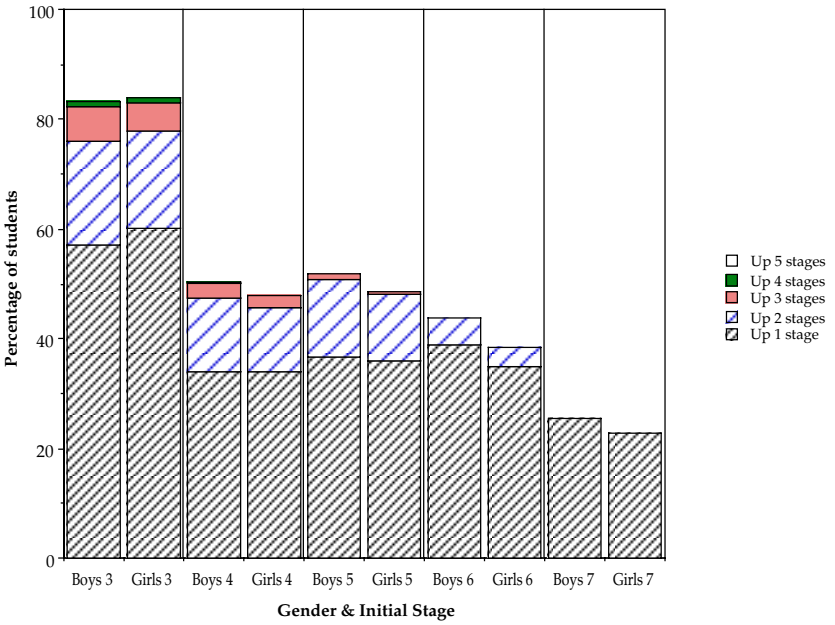

Figure 22. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for Fractions/Ratios as a function of Initial Stage & Gender

Discussion

The analysis of data from the numeracy project shows that students' achievement in numeracy was enhanced by the participation of their teachers in one of the professional development programmes run as part of the numeracy project (ie, ENP, ANP, or INP). This finding is consistent with both quantitative and qualitative evidence from the evaluation reports (see Higgins, 2001, 2002, 2003; Irwin, 2003; Irwin & Niederer, 2002; Thomas & Ward, 2001, 2002; Thomas Tagg & Ward, 2003). The evaluation reports show also that teachers' involvement in the numeracy project has had a huge impact on many of them in terms of their confidence and personal understanding of mathematics and mathematics pedagogy. A critical dimension of the project has been the way that it has focused teachers' attention on students' mathematical thinking and reasoning, and provided ways to use that information to plan more effective teaching.

Disparities in Numeracy Learning

As the findings of this study have shown, Asian and European/Pākehā students seem to have benefited more from participation in the project than Māori and Pasifika students. This kind of pattern, sometimes referred to as the "Matthew Effect" because "the rich get richer and the poor get poorer" (relatively speaking), was identified in the field of literacy education almost two decades ago (eg, Stanovich, 1986). As a recent Ministry of Education literacy document has acknowledged, "some groups of students have not been well served by the conventional literacy practices in our schools… The patterns have been well documented: Māori children, Pasifika children, children whose home language is not English, and children in low decile schools achieve, on average, at a lower level than other children" (Ministry of Education, 2003, p. 10). Moreover, there is a tendency for initial disparities in literacy to increase during subsequent years at school. Literacy education researchers have done considerable work on ways to address this issue by helping teachers "fine-tune" their teaching in order to meet the learning needs of their students more effectively. As a consequence of this fine-tuning process, teachers have raised their expectations for what students could achieve (eg, Phillips, McNaughton & McDonald, 2002; Ministry of Education, 2003a; Timperley, Phillips, & Wiseman, 2003a, 2003b). As Phillips and colleagues point out, the pattern of low progress "is neither inevitable nor unbridgeable" (2002, p. 6).

While there is clearly concern about disparities in mathematics achievement, little has been done to explore systematically the impact of variables like ethnicity, gender, and socio-economic status, or help teachers better meet the learning needs of Māori and Pasifika students. This study has enabled a more fine-grained analysis of the relationships among ethnicity, gender, and socio-economic status to be undertaken.

The findings of this study have important implications for the issue of equity in mathematics education. The equity principle of the National Council of Teachers of Mathematics (NCTM) in the US, states that "excellence in mathematics education requires equity – high expectations and strong support for all students" (Joyner & Reys, 2000). Teacher expectations are crucial as many demographic groups have been the victims of low expectations in the past (NCTM, 2000). The equity principle challenges the idea that only some students are capable of learning mathematics, a belief that is widespread in society. The new slogan which has begun to appear in recent mathematics education literature is "Mathematics for All" (eg, Abrantes, 2001; Croom, 1997; Gates & Vistro-Yu, 2003). As NCTM documents point out, equity requires accommodating differences to help everyone learn mathematics. A

social justice model has been favoured over other models for achieving equity (see Leder et al, 1996). In the social justice model it is accepted that individuals will differ in some ways and not others. Justice and equity can be achieved only if differences are respected and catered for appropriately. This sometimes involves the use of differential treatment and actions when that is likely to be the most beneficial.

It was interesting to note from the data analysis that Māori boys performed better than Māori girls, and this difference sometimes reached statistical significance. This pattern is opposite to the one found in some of large-scale international studies such as the Third International Mathematics and Science Study (TIMSS) which found that Māori girls outperformed Māori boys (Garden, 1996, 1997, 1998). A possible reason for this discrepancy is that the numeracy project assessment (NumPA), which is done individually with the child's own teacher, was a fairer assessment of students' mathematical thinking than the paper-and-pencil assessments used in the TIMSS study, which may have disadvantaged Māori boys. In the numeracy project, not only is the assessment individualised, but the tasks are presented by the teacher orally, and performance is not limited by students' reading and writing skills. The teacher is also able to monitor a student's motivation to continue solving the problems presented, and make any adjustments needed to bring the student back "on task." The individualised nature of the numeracy project assessment may be more engaging for Māori boys than a group assessment paper-and-pencil situation, where their disengagement from the task may go unnoticed by a teacher supervising a class full of students.

The gender patterns evident in this data (favouring boys) are consistent with literature on the math-fact retrieval hypothesis which shows that boys are able to access number facts more quickly and effectively than girls (see Geary, 1999; Royer et al 1999a, 1999b; Wigfield & Byrnes, 1999). If this pattern is as consistent as the research on the math-fact retrieval hypothesis suggests, then it indicates the need to provide more support for girls at the upper stages of the framework to help them learn to use advanced additive, multiplicative, and proportional thinking.

The Importance of Culturally Relevant Pedagogy

A substantial body of international literature has focused on the importance of having a culturally relevant (inclusive/responsive) pedagogy (see Cummins, 2001; Ladson-Billings, 1994, 1995, 1997; McNeil, 2000; Parish, 1996; Singham, 1998; Sleeter, 1997, 2003). The "cultural gap" between teachers and students, and the impact this has on students' learning has been identified as a key issue (Sleeter, 2003). "Cultural domination" is an extension of the idea of cultural difference, and attributes educational disadvantage to the oppressive processes of a dominant culture imposed on children from minority groups (Bereiter, 1985; Biddulph, Biddulph & Biddulph, 2003). This can be seen in schools, many of which tend to reflect predominantly middle-class, western cultural values and practices.

Several New Zealand academics have written about *eurocentrism*, and its connection to the concept of epistemological racism. Bishop and Glynn (1999) have argued that mainstream efforts to address cultural diversity in New Zealand have been "singularly inadequate" because of the way that racism is embedded in the fundamental principles of the dominant (Pākehā) culture. The NZ Curriculum Framework document states that all students will be provided with equal educational opportunities, and "all programmes will be gender–inclusive, non-racist, and non-discriminatory, to help ensure that learning opportunities are not restricted" (Ministry of Education, 1993, p. 7). The Curriculum Framework document also states that "the school curriculum will be sufficiently flexible to respond to each student's learning needs [and] to a new understanding of the different ways in which people learn" (p. 6). While such rhetoric is laudable, there is substantial evidence to show that much educational practice falls short of these goals.

Other New Zealand academics such as Macfarlane (2004) have written about the important role that culture plays in education, and the implications this has for teachers and teaching, as well as for learners and learning. He talks about the need for sensitivity to the cultural background of Māori students to enable educators to respond appropriately to the learning needs of students in their classrooms, using what he refers to as "culturally responsive pedagogy". Although the suggestions he makes have been designed for Māori, many of them are just as relevant for students of other ethnic backgrounds. According to Macfarlane, the key characteristic of programmes that cater effectively for the learning needs of Māori students is "cultural centredness". This comes from having a better match between the culture of western schooling and Māori cultural values.

Bishop & Glynn (2000) have written about the importance of culture, and the need for classrooms to be places where learners feel safe to bring "who they are" to the learning interactions, and where their knowledges are regarded as acceptable and legitimate. Bishop and Glynn (1999) have also written about the issue of power imbalance, and the importance for students of having their cultural identity recognised in helping to shift the balance of power. Bishop's research with Māori year 9 and 10 students has shown just how important the relationships between teachers and students are for effective learning to occur in schools (see Bishop, Berryman, Tiakiwai, & Richardson, 2003). It was the quality of in-class face-to-face interactions and relationships between teachers and their Māori students that was critical in creating a learning context in which Māori students' educational achievement could be raised. Intervention using professional development programmes designed to change teacher-student relationships and interactions has resulted in increases in Māori students' on-task engagement, better work completion, and higher achievement, together with a reduction in their absenteeism.

Recent literature in the literacy education field in New Zealand has acknowledged the importance of taking culture into account. For example, a publication by the Ministry of Education on effective literacy practices in the early school years has acknowledged that the disparities in literacy achievement are related to the increase in cultural and linguistic diversity in our schools. The document goes on to discuss features of effective practice that could help teachers to reduce those disparities (see Ministry of Education, 2003). This literacy material focuses on the concept of *cultural engagement*, and the way that "culturally based values and knowledge affect each learner's engagement and interest in the learning activity" (p. 23). According to the Ministry of Education, cultural engagement is particularly important in classrooms with students from diverse backgrounds, especially where their cultural backgrounds differ from that of the teacher.

The Cultural Appropriateness of Mathematics Pedagogy

International writers have drawn attention to the lack of consideration given to the cultural appropriateness of mathematics pedagogy. For example, Tate (1994) asserts that "connecting the pedagogy of mathematics to the lived realities of … students is essential to creating equitable conditions in mathematics education" (p. 478). Unfortunately many students get the message that school mathematics is a subject that is divorced from their everyday experiences and from their efforts to make sense of their world, the result, Tate argues, of "foreign pedagogy". According to Tate, "the curriculum and pedagogy of mathematics have been and continue to be eurocentric precepts that exclude [minority students'] experiences" (p. 479).

Some mathematics educators such as Willis (2000) and Pinxten (1994a, 1994b) have questioned the appropriateness of approaches developed by the dominant (European) culture for indigenous students. Willis has written about the way that some Australian Aboriginal children can quantify collections of eight or nine objects at a glance (by subitizing), yet seem unable to count in the conventional sense. Many of the frameworks developed by education systems across the world (including

those used in NZ and Australia) begin with counting-based stages, and progress to derived number facts (or part-whole thinking). Hence, some students may be disadvantaged by the assumption that counting comes before quantification. Pinxten (1994a) argues that:

> "the commonly used mathematical language has a structure that is decidedly that of the European languages; it distinguishes clearly between things (classes, categories, sets, etc) and operations on things (sum, division, etc)… At a more specific and conscious level, a generic atomism is projected as the basic order of reality for the Westerner: things can be understood as wholes which consist of constituent parts, and as parts in an englobing whole, One can know the world by dividing it in smaller parts and study those, and by combining knowledge about parts one can understand the greater whole… this part-whole reasoning is essential in mathematics too; a set has elements, a geometric figure has parts… and counting, algebra and geometry are taught by means of part-whole metaphors… [In other languages/cultures] the world is seen as movement, dynamic forces and the like, rather than things or structures" (p. 91).

Further research is needed to explore the possibility that indigenous and minority students can develop an understanding of the number system by means other than verbal counting; for example, spatial visualization of number patterns. Although the numeracy project has a heavy emphasis on counting (seen particularly in the early framework stages for Addition/Subtraction), it also includes work on spatial visualisation through the use of ten frames, and the focus on imaging quantities as an intermediate step between working with concrete materials and dealing with number properties at an abstract level.

Several New Zealand academics have written about issues of culture for mathematics education (eg, Barton, 1995, 1996; Clark, 1999; Knight, 1995). Clark has suggested that teaching practices in mathematics classes need to be changed to be more inclusive of Māori students. This might mean having less formality and competition by getting students to work in groups, and taking mathematics outside the classroom, using culturally appropriate and contextualized examples, resources and traditions, and helping teachers understand that mathematics is not the preserve of Western or Asian cultures – traditional Māori culture "was knowledgeable and skilled in many forms of mathematics" (Clark, 1999, p. 36).

Although there are aspects of the numeracy project which are particularly suited to the preferred learning styles of Māori and Pasifika students, such as working in groups, there is little reference in the numeracy project materials (for English-medium teachers) to the issue of cultural and linguistic diversity for mathematics education, or explicit suggestions about how teachers could address this issue as part of the their numeracy teaching. A version of the numeracy project has been developed specifically for students in Māori-medium settings (*Te Poutama Tau*), but this only caters for about 20% of Māori students in the education system. The majority of Māori students are in English-medium settings. The almost complete invisibility of culture within the numeracy project materials (for English-medium teachers), could give the implicit message that culture is not important in numeracy learning. Yet as the findings reported here show, this is clearly not the case.

Some writers have even suggested that mathematics has played a crucial role in the colonisation process. For example, Vithal and Valero (2003) have written about the consequences of colonisation by "European invaders" and the subsequent denial of aboriginal languages, religions, values, and ways of thinking. They see mathematics as having played a major role in this colonisation process, in its contribution to what they call the "occupation of the mind".

> "The establishment of educational systems that followed the rules of the colonial powers was one of the strong means … of assuring the imposition of the functional

> Western values and behaviours in the maintenance of colonial power. Mathematics, as a unique representative of the Western worldview, contributed to that 'occupation of mind'" (p. 547).

It is important to remain vigilant about the continuing impact of colonisation, and the extent to which it can still be felt within an initiative such as the numeracy project, albeit in very subtle ways. There is an urgent need for more Māori and Pasifika people to be involved in the project at all levels, particularly as facilitators working with teachers in schools where there are large numbers of Māori and Pasifika students. As Macfarlane (2004) points out, most teachers in New Zealand schools are non-Māori and monocultural, a point made more than thirty years ago by Ranginui Walker and almost as true today as it was then.

Closing the Gap between Māori/Pasifika and other Students

Evidence on ways to close the gap between Māori/Pasifika and other students has come from research in the literacy field which used "precision teaching," finely tuned instruction based on astute observation of children's behaviour (see Phillips & Smith, 1997; Phillips, McNaughton, & MacDonald, 2002). *Picking Up the Pace* was a project designed to raise the literacy achievement of children in decile one (low socio-economic status) schools involved in the Early Childhood Primary Links via Literacy (ECPL) Project, as part of a much broader project, the Strengthening Education in Mangere and Otara (SEMO) schooling improvement initiative in South Auckland (Phillips et al, 2002). One of the key messages from this project is that levels of literacy achievement ***can*** be raised for children in low decile schools. By the time the project children were six, they were reading and writing at levels close to those achieved by six-year-olds across the country (Phillips et al, 2002). The key ingredients in the success of this project seem to have been the use of an integrated approach which involved communities, educators, researchers, and the Ministry of Education working together to improve literacy instruction in ordinary programmes within community early childhood centres and classrooms in mainstream schools. The teachers were open and committed to a professional development programme which challenged their ideas and expectations about: how children become literate; children's ability to learn; themselves as expert professionals; and, their effectiveness as teachers (see Phillips et al, 2002). Participation in the professional development project enhanced teachers' understanding about the development of literacy, raised their expectations for students' achievement, and helped them to develop more effective practice as teachers.

Prior to the SEMO project, the Ministry of Education launched a public information campaign, known as *Feed the mind/Whangaihia te hinengaro*, designed to encourage low-income families to support the literacy and numeracy skills of their preschool and beginning school children (Ministry of Education, 2000b, 2000c, 2000d, 2000e, 2000f, 2000g). Posters, leaflets, swatches (cards connected at one end that can be spread out in a fan shape), and television and radio advertisements were produced as part of the campaign. A video was produced to explain why the "Feed the Mind" metaphor was chosen for the campaign, including the use of the word "ako" in Māori to refer to both learning and teaching, the word "kaiako" (teacher) consisting of the combination of "kai" (food) and "ako" (learn/teach), and the special significance of food to Māori and Pasifika peoples (Ministry of Education, 2000g). The campaign was designed to present everyday ways to make learning fun for children and their families. Activities included such things as looking out the car window at street signs, number plates, and objects that can be named, counted, or categorised in terms of shape or size. Other activities included shopping at the supermarket, preparing a meal at home, playing at the beach, making books out of magazine pictures, painting the fence, and timing the lawn mowing.

Putting the Focus on Quality Teaching

Several large studies have been undertaken to identify the key variables contributing to differences in student achievement (eg, Alton-Lee, 2003; Hattie, 2002). Hattie (2002) identified five major sources of variance in students' achievement, including: students themselves (~50% of variance), their teachers (~30%), their homes (5-10%), their schools (5-10%), and their peers (5-10%). As Hattie (2002) points out, "it is what teachers know, do, and care about which is very powerful in this learning equation" (p. 6). He argues that the focus should be on the greatest source of variance that can make the difference – the teacher, and suggests that "we need to direct attention at higher-quality teaching, and higher expectations that students can meet appropriate challenges" (p. 7). According to Hattie, the major dimensions of excellent teachers include being able to: identify essential representations of their subject; guide learning through classroom interactions; monitor learning and provide feedback; attend to affective attributes; and influence student outcomes. Hattie argues that while content knowledge is important, it is pedagogical content knowledge – the way knowledge is used in teaching situations - that is more important.

Nuthall's (2001, 2002) work has focused on the changes that take place in the minds of students, not just in what they know but also in what they believe, and what they can do as result of that new knowledge and understanding. Nuthall argues that a combination of interviewing and observation can enable teachers to find out just what students have learned. He reminds us that teaching effects can vary over time and across context, and because learning is a continuous, cumulative process, the monitoring of student learning must also be continuous. He argues that the focus needs to be on individual students because individuals can have quite different experiences within the same classroom. Researchers need to look for connections between students' classroom experiences (ie, teaching) and their learning, and the goal should be an evidenced-based theory about what is happening in the classroom and in the minds of students.

In 2003, the Ministry of Education put together a *Best Evidence Synthesis* of research on *Quality teaching for diverse students in schooling* (see Alton-Lee, 2003). According to Alton-Lee, quality teaching is a key influence on outcomes for diverse students. She claims that "up to 59% of variance in student performance is attributable to differences between teachers and classes" (p. v), while about 20% is attributable to school level variables. She has identified several characteristics of quality teaching which include the importance of having caring, inclusive, and cohesive learning communities, of having effective links between school and students' other cultural contexts, and of teachers scaffolding learning and providing appropriate feedback on students' task engagement.

Evidence from several studies suggests that teachers' attitudes, values, behaviours, effort and skills are critical in the forming of effective teacher-student relationships that help students to learn (Bishop, 2002; Bishop et al, 2003; Hawk, Cowley, Hill & Sutherland, 2003; Macfarlane, 2004). Characteristics such as empathy, caring, respect, passion to enthuse and motivate, patience and perseverance, belief in students' abilities are important.

The professional development programme for teachers has been a key component of the numeracy project. The project has put much of its focus on helping teachers to become better teachers of mathematics. Dimensions of the PD programme such as the in-class modelling by facilitators have been extremely effective in providing teachers with alternative ways of approaching the teaching of mathematics (see Higgins, 2002). The support of teachers by the facilitators has gone a long way towards addressing the second of the three themes underpinning the Literacy and Numeracy Strategy, improving professional capability (see Parsons, 2001).

Teacher Expectations
There is considerable evidence to show that teachers' expectations of students can have an impact on students' achievement (eg, Cooper & Good, 1983; Dean, 2001; Gipps, 1993; Gipps & MacGilchrist, 2002; Hattie, 2002; Lingard & Mills, 2002; Mitchell, Cameron, & Wylie, 2002; Mortimore, Sammons, Stoll, Lewis & Ecob, 1988; Lingard & Mills, 2002; Nieto, 1994; Palardy, 1969; Phillips, et al, 2002; Prochnow, Tunmer, Chapman & Greaney, 2001; Rosenthal & Jacobsen, 1968; Timperley, Robinson & Bullard, 1999; Tizard, Blatchford, Burke, Farquhar & Plewis, 1988). Recent research has commented on the importance of raising teachers' expectations of what children can achieve, and of maintaining those high expectations over time (Timperley, 2003a, 2003b). The issue of teacher expectations is highly relevant to the process of choosing which form of assessment (A, B, or C) to use with a particular student as part of the diagnostic interview. There is considerable research evidence to suggest that teachers underestimate what their pupils are capable of doing. According to the Ministry of Education (2003, p. 153), "the impact of expectations is especially significant for students from diverse cultural and linguistic backgrounds."

Mathematics as a Gatekeeper
Traditionally mathematics has been used as a gatekeeper, often being one of the subjects used in the assessment of the intellectually gifted and by schools to group students into classes by ability (ie, streaming/setting/tracking). It is also used as a filter for access to further to further education, thus imposing a barrier to those struggling for fairer and more just distribution of goods, services, and opportunities for education and work, and for positions of power to control these (Vithal & Valero, 2003). As Clark (1999) points out, low mathematics participation, especially at the senior secondary and tertiary levels, prevents students from accessing many occupations. Despite slogans such as "Mathematics for All," there is still a sense that being good at mathematics is predominantly a white male activity. Even in a project that is explicitly about helping ***all*** teachers help ***all*** students to do better in mathematics, it is mostly people with European ancestry rather than Māori or Pasifika people who make the majority of the decisions about the project and its implementation in English-medium schools. Bishop and Glynn's (1999, 2000) point about the importance of power sharing is relevant here. For an initiative like the numeracy project to be effective for all students, we need people from Māori and Pasifika communities having more of a say in what should happen with the project. Most of the Māori facilitators seem to be involved in *Te Poutama Tau*, the numeracy project for students in Māori-medium settings. Perhaps it is time that active steps were taken to recruit Māori facilitators for numeracy projects in English-medium settings to help teachers provide more appropriately for the needs of Māori learners. The issue for Pasifika is similar – more facilitators are needed to bring a strong Pasifika dimension to the project for teachers who are trying to meet the learning needs of Pasifika students (see Fusitu'a & Coxon, 1998).

Involving the Family/Whanau and Community
The third of the three themes underpinning the Literacy and Numeracy Strategy is about involving the community. Research has shown that fostering home-school partnerships can help raise academic achievement and improve children's attitudes to learning (Biddulph et al, 2003; Bratina, 1996; Cummins, 2001; Merttens, 1999; O'Connell, 1992; Peressini, 1997, 1998). As Macfarlane (2004) has recently pointed out, "parental participation is an indispensable ingredient in academic excellence" (p. 69). Similarly, the report of New Zealand's Literacy Taskforce states, "children's learning is enhanced by effective partnerships between school and home" (Ministry of Education, 1999; p. 4). According to the Taskforce report, if there is good home-school communication and shared understanding of literacy and numeracy goals, this will help raise overall achievement, particularly in mathematics.

A great deal more has been done in the literacy education field to address this third theme than in mathematics education to date. For decades, taking a book home to share with family/whanau has been an accepted part of children's daily routine from their first day at primary school, and has helped to build home-school partnerships around literacy (eg, McNaughton, 1995; McNaughton, Parr, Timperley & Robinson, 1992). Programmes to assist parents to tutor their children in reading have also been quite common (eg, McNaughton, Glynn, & Robinson, 1981).

Although schools have established commonly accepted principles for home reading programmes, there are usually no parallel programmes for home mathematics (Merttens, 1999). "Homework" in mathematics in the early primary years, at least, has been relatively uncommon. A notable exception was the use of maths newsletters to give parents ideas for activities they could do with their children to support their mathematics (see Savell, 1998). There have been some programmes to support parents in helping their children with mathematics (eg, Griffen & Coles, 1992; Peters, 1998; Young-Loveridge, 1993). However, such efforts have not been picked up and implemented on a larger scale. Because the numeracy project is advocating some quite different ways of approaching mathematics from those which children's parents and whanau learned at school, it is important that families are helped to become aware of how the current approach differs from what they learned when they were at school. One of the strong messages coming through from the numeracy project is that "students should not be exposed to standard vertical algorithms until they use part-whole mental strategies" (emphasis in the original, Ministry of Education, 2004a, p. 8). Unless families are helped to become aware of what this statement means in practice, it is likely that they will continue to try and help their children using the ways that they were taught at school. Many families might take advantage of information presented on educational websites such as tki and nzmaths.co.nz.

An investigation of parents' perspectives on their children's mathematics learning in a school which had been involved in the Advanced Numeracy Project for most of the year, found that the parents knew little about the project (see Eyres & Young-Loveridge, in preparation). However, since that study was completed, the Ministry of Education (2004c, 2004d) has produced two attractive pamphlets for parents of students in Years 3-6 and 7-8 informing them about the project, and letting them know some simple ways they can encourage their children and help them learn, including: discussing what everyday numbers mean, playing mathematical games together, working together on problems around the home, taking an interest in how their children figure things out, helping their children to manage time and money, and exploring numeracy websites together. The brochure emphasises that "there is usually more than one way to solve a problem. If your child has a strategy that works, praise them. If yours is different, that's quite OK." The brochure also lists the kinds of things that children are learning on the numeracy projects, including calculating "in their head where possible, rather than using a calculator or pen and paper." Unfortunately, the Ministry of Education has not produced a brochure for the families of students in years 0-2, because it was advised that a brochure was not needed at this level. Although the "Feed the Mind" brochure is very helpful, it does not include a message that different ways to solve problems may be equally acceptable, and that mental calculation is preferable to paper and pencil methods.

Parents' attitudes towards mathematics can be problematic for their children in a number of different ways. For example, fear and/or dislike of mathematics, originating from parents' own negative school experiences, can produce anxiety and insecurity, and this is often passed on to their children (see Eyres & Young-Loveridge, in preparation; Young-Loveridge, 1993). On the other hand, parents whose success in mathematics was due to the use of rote learning and/or pencil and

paper algorithmic methods, may be resistant to changes in the teaching methods used by teachers with their children.

Within the early childhood education community, there is usually reasonably good communication between families and early childhood teachers. The holistic nature of the curriculum means that literacy and numeracy are not singled out as curriculum areas on their own, but are woven through the strands of the curriculum (see Ministry of Education, 1996; Peters, 2001). There is much that schools could do to help their communities become more aware of how the numeracy project is affecting the teaching of mathematics in schools. Some schools have taken initiatives to this effect already, but much more needs to be done.

Research has shown that children in families with a strong orientation towards numeracy seemed to have good number concepts and skills when they arrived at school at the age of five (Young-Loveridge, 1989, 1993). These children were encouraged to use mathematics to solve real-life problems, such as counting down the days until Christmas or their next birthdays, working out who had the most money in an adults' Poker game, and working out distance and speed on a trip. In contrast, children whose families had an orientation towards literacy but not to numeracy seemed to have fewer number concepts and skills. Other research has shown how cooking can provide a valuable context for developing the mathematical thinking of young children (Young-Loveridge, 1996).

Parents' (particularly mothers) levels of education has been identified as important for children's academic achievement (see Biddulph et al, 2003). New initiatives in the field of numeracy for adult learners are under way, and should begin to address some of these issues for adults in the near future, but it will take some time before the impact of these initiatives is felt.

Good Things Take Time

There is ample evidence to show that many primary school teachers have had negative experiences of mathematics learning at school themselves, and this has resulted in a lack confidence and enthusiasm for mathematics. Evaluations of the numeracy project have shown consistently that teachers' confidence and professional capability has improved substantially as a result of their involvement in the project. It may be that, before teachers can effectively tailor their teaching to the individual needs of their students, they need to have sufficient confidence and pedagogical content knowledge to teach mathematics effectively to majority group students.

The numeracy project has required a huge shift in teachers' thinking away from teaching rules, procedures, and algorithms, and the idea that there is one and only one way to solve a problem, towards accepting that there are often many possible solution strategies for a particular problem, and the reasoning and justification for those strategies is at least as, if not more, important than simply getting the "right answer". Most teachers have only had a year in the professional development programme for the project. For some teachers, this will simply not be enough time to fully understand the project and implement it with all their students. As many teachers are still becoming familiar with this different approach to teaching mathematics, it is perhaps to be expected that their teaching will be more effective with some subgroups of students (eg, Asian & European/Pākehā) than others, simply because the classroom culture is more familiar to those particular subgroups of students and this advantages their learning.

It is well known that many primary teachers are more confident about teaching literacy (reading, writing, speaking, listening) than they are about teaching mathematics (see Higgins, 1999; Thomas, 1999). Research showing that it is possible to narrow the gaps in literacy is relatively recent. The challenge to

mathematics educators of raising teachers' confidence and understanding in mathematics to a level which is comparable to that for literacy is probably going to take some years. While it is important to be aware that Māori and Pasifika students need more support with numeracy learning and to try to meet their learning needs more effectively, the reality is that it may take several years for many primary teachers to reach the level of knowledge and confidence that they have with literacy education.

It is important in interpreting the findings to remember that the numeracy projects are constantly evolving in response to feedback from teachers, principals, facilitators, and researchers. In a few years, it may be possible to look back and identify phases in the implementation process with distinctive hallmarks. The initial focus seems to be on professional development for teachers to improve their knowledge, understanding and confidence in their own mathematics and the pedagogy of mathematics education. Until teachers have reached a certain level of expertise with the mathematics themselves, they will be unable to do the fine-tuning needed to cater for the different learning needs of students from different ethnic groups. On the other hand, nothing will change unless teachers are alerted to the urgent need for change in order to provide a fairer deal for their students from different linguistic and cultural backgrounds.

Summary

The results of the data of students at Years 0 – 8 shows that students made significant progress on The Number Framework over the course of the numeracy projects. All students benefited from participation in the Numeracy Development Project, regardless of ethnicity, gender, and socio-economic status. However, the relative differences between subgroups were virtually identical at the end of the project. The gap was widened rather than narrowed.

Students who participated in one of the projects in 2001 did slightly better than those who participated in 2002 or 2003. There are several possible reasons for this pattern, including the operation of ceiling effects in 2002, and stricter criteria to qualify as Advanced Additive Part-Whole on Addition/Subtraction in 2003.

Asian and European/Pākehā students began the project at higher stages on the number framework than students of Māori and Pacific Islands descent, and benefited more from participation in the project than students of Māori and Pacific Islands descent, hence the "achievement gap" was widened by the project, rather than narrowed. This so-called "Matthew Effect," with the rich getting richer and poor getting poorer (relatively speaking) parallels a pattern found in literacy education.

In general, boys benefited more from the project than girls. Although girls who began the project at lower framework stages (ie, Counting from one) appeared to make similar or slightly better progress than boys who began at the same stage, the opposite pattern was found at higher framework stages, with more boys progressing to higher stages than girls.

Students at high decile schools started the project at higher framework stages than those at low and medium decile schools, and made the largest gains over the course of the project.

Ethnicity, gender, and school decile level had a combined effect on students' performance and progress. For example, being Māori, being a girl, and attending a low decile school was more disadvantageous than any one of those factors on its own.

Analysis of the patterns of progress showed that even when starting points were taken into account, European/Pākehā and Asian students made greater progress on the framework than Māori or Pasifika students over the course of the project.

Building the professional capability of teachers in mathematics has been an important first step for the numeracy project. The challenge now is to sensitise teachers to the particular learning needs of Māori and Pasifika students so that they can meet those needs more effectively. Involving family/whanau and the wider community in supporting children's mathematics learning is another dimension that needs to be developed further.

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Appendix D: Figures showing Patterns of Performance (Initial & Final stages) and Progress (Final Stage as a function of Initial stage) for Multiplication/Division and Fractions/Ratios

Appendix E: Tables showing increases in percentages of students at particular stages on the number framework

Appendix F: Percentage of students who progressed to a higher stage on the framework for each operational domain as a function of Initial Stage (Patterns of Progress)

Appendix G: Values of Chi Squared and associated probability values for Gender Differences in Patterns of Progress

Appendix A: The New Zealand Number Framework

Emergent

Cannot count a collection of objects (ie, the number sequence is faulty and/or one-to-one correspondence with counting words is not maintained).

One-to-one Counting

Can count a single collection of 10 objects, but cannot use counting to join (add) or separate (subtract) collections (eg, 4 and 3).

Counting from One on Materials

Counts all objects in both collections to work out the answer to an addition or subtraction problem
(eg, 4 and 3: uses fingers & counts 1, 2, 3, 4…..5, 6, 7).

Counting from One by Imaging

Can image visual patterns of objects (visualisation), but counts all to work out solution (eg, 4 and 3: counts mentally 1, 2, 3, 4..…5, 6, 7).

Advanced Counting

Counts on from one collection to add the second
(eg, 9 + 8: 9….10, 11, 12, 13, 14, 15, 16, 17).

Early Additive Part-Whole

Uses knowledge of number properties to break numbers apart (partitioning) and recombine them to work out solution
(eg, 9 + 8: take 1 from 8 to put with 9 to make 10, then add remaining 7).

Advanced Additive Part-Whole

Chooses from a range of part-whole strategies to solve addition and subtraction problems, and begins deriving multiplication from known facts
(eg, $53 - 26 = 53 - 30 + 4 = 23 + 4 = 27$
or $26 + (4 + 20 + 3) = 53$ so $53 - 26 = 27$
$6 \times 6 = (5 \times 6) + 6 = 30 + 6 = 36$)

Advanced Multiplicative Part-Whole

Chooses from a range of part-whole strategies to solve multiplication and division problems
(eg, $72 \div 4$: $10 \times 4 = 40$, $72 - 40 = 32$, $8 \times 4 = 32$, $10 + 8 = 18$
or $72 \div 2 = 36$, $36 \div 2 = 18$).

Advanced Proportional Part-Whole

Chooses from a range of part-whole strategies to solve problems involving fractions, proportions, and ratios
(eg, 10 balls of wool make 15 beanies. How many needed for 6 beanies? 10 is $^2/_3$ of 15 so 4 is $^2/_3$ of 6,
or 1 ball makes 1.5 beanies so 2 balls make 3, so 4 balls make 6 beanies).

This version of the New Zealand Number Framework is based on Ministry of Education (2004a, 2004b)

Appendix B

Number of students in each project as a function of ethnicity, gender, and school decile level

Table B1. Number of students in ENP project as a function of ethnicity, gender, and school decile level

	School Decile Level				
	Low	Medium	High		
(Years 0-3)	1-3	4-7	8-10	Total	(%)
		2001			
Ethnicity					
NZ European	3694	8999	6515	19488	(58.7)
Māori	4661	2367	520	7676	(23.1)
Pasifika	2857	545	98	3554	(10.7)
Asian	384	317	651	1363	(4.1)
Other	483	316	307	1122	(3.4)
Total	***12079***	***12544***	***8091***	***33203***	*(100.0)*
(%)	*(36.9)*	*(38.3)*	*(24.7)*	*(100.0)*	
Gender					
Girls	5751	6152	3830	16004	(48.2)
Boys	6328	6391	4261	17199	(51.8)
		2002			
Ethnicity					
NZ European	2144	4981	4740	12417	(59.3)
Māori	2970	1257	282	4577	(21.9)
Pasifika	1654	330	69	2121	(10.1)
Asian	203	417	264	1004	(4.8)
Other	250	318	198	810	(3.9)
Total	***7221***	***7305***	***5553***	***20931***	*(100.0)*
(%)	*(36.0)*	*(36.4)*	*(27.7)*	*(100.0)*	
Gender					
Girls	3568	3538	2704	10305	(49.2)
Boys	3653	3720	2849	10624	(50.8)
		2003			
Ethnicity					
NZ European	5231	13466	13424	32121	(58.4)
Māori	7436	3546	987	11969	(21.8)
Pasifika	4849	785	227	5861	(10.7)
Asian	679	1079	935	2693	(4.9)
Other	713	845	758	2316	(4.2)
Total	***18908***	***19723***	***16331***	***54962***	*(100.0)*
(%)	*(34.4)*	*(35.9)*	*(29.7)*	*(100.0)*	
Gender					
Girls	9283	9599	8084	27635	(49.1)
Boys	9625	10122	8247	28620	(50.9)

Table B2. Number of students in ANP project as a function of ethnicity, gender, and school decile level

	School Decile Level				
	Low	Medium	High		
(Years 4-6)	1-3	4-7	8-10	Total	(%)
		2001			
Ethnicity					
NZ European	1467	2274	1398	5139	(63.5)
Māori	928	465	78	1471	(18.2)
Pasifika	536	183	51	770	(9.5)
Asian	124	149	210	483	(6.0)
Other	60	116	55	231	(2.0)
Total	***3862***	***4020***	***2082***	***8094***	*(100.0)*
(%)	*(38.8)*	*(40.3)*	*(20.9)*	*(100.0)*	
Gender					
Girls	1489	1569	867	3925	(48.5)
Boys	1626	1618	925	4169	(51.5)
		2002			
Ethnicity					
NZ European	3466	8640	6710	19600	(57.6)
Māori	4748	2447	569	8038	(23.6)
Pasifika	2320	532	117	3193	(9.4)
Asian	435	353	724	1700	(5.0)
Other	428	480	536	1505	(4.4)
Total	***11397***	***12452***	***8656***	***34036***	*(100.0)*
(%)	*(35.1)*	*(38.3)*	*(26.6)*	*(100.0)*	
Gender					
Girls	5515	6058	4137	16461	(48.4)
Boys	5882	6394	4519	17575	(51.6)
		2003			
Ethnicity					
NZ European	5910	14599	12471	32980	(59.3)
Māori	8220	3956	997	13173	(23.7)
Pasifika	3592	850	217	4659	(8.4)
Asian	581	782	1058	2421	(4.4)
Other	666	916	784	2366	(4.3)
Total	***18969***	***21103***	***15527***	***55599***	*(100.0)*
(%)	*(34.1)*	*(38.0)*	*(27.9)*	*(100.0)*	
Gender					
Girls	9293	10214	7629	28036	(48.9)
Boys	9676	10889	7898	29280	(51.1)

Table B3. Number of students in INP project as a function of ethnicity, gender, and school decile level

	School Decile Level				
	Low	Medium	High		
(Years 7-8)	1-3	4-7	8-10	Total	(%)
		2001			
Ethnicity					
NZ European	425	414	291	1130	(60.2)
Māori	201	173	5	379	(20.2)
Pasifika	47	11	17	75	(10.7)
Asian	11	4	191	206	(4.0)
Other	21	13	54	88	(4.7)
Total	***705***	***615***	***558***	***1878***	*(100.0)*
(%)	*(37.5)*	*(32.7)*	*(29.7)*	*(100.0)*	
Gender					
Girls	325	291	276	892	(47.5)
Boys	380	324	282	986	(52.5)
		2002			
Ethnicity					
NZ European	585	1939	935	3459	(55.4)
Māori	903	703	71	1677	(26.9)
Pasifika	403	132	26	561	(9.0)
Asian	57	77	166	300	(4.8)
Other	78	91	75	244	(3.9)
Total	***2026***	***2942***	***1273***	***6241***	*(100.0)*
(%)	*(32.5)*	*(47.1)*	*(20.4)*	*(100.0)*	
Gender					
Girls	959	1435	615	3009	(48.2)
Boys	1067	1507	658	3232	(51.8)
		2003			
Ethnicity					
NZ European	1589	3800	1476	6865	(52.8)
Māori	2226	1300	151	3677	(28.3)
Pasifika	1135	220	38	1393	(10.7)
Asian	198	169	216	583	(4.5)
Other	225	151	103	479	(3.7)
Total	***5373***	***5640***	***1984***	***12997***	*(100.0)*
(%)	*(41.3)*	*(43.4)*	*(15.3)*	*(100.0)*	
Gender					
Girls	2600	2757	946	6303	(48.5)
Boys	2773	2883	1038	6694	(51.6)

Appendix C

Percentages of students on each project at each framework stage (Initial & Final Stage)

Table C1. Percentage of ENP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=19487)*	*(n=7676)*	*(n=3554)*	*(n=1363)*	*(n=33203)*
Emergent	8.8	17.6	21.6	9.9	12.5
1:1 Counting	17.0	19.7	21.7	13.1	18.0
Count from 1 (materials)	25.7	27.3	26.4	20.2	25.9
Count from 1 (imaging)	12.6	11.5	10.9	11.2	12.0
Advanced Counting	27.0	19.3	16.5	29.1	24.1
Early Additive P/W	7.9	4.1	2.6	13.9	6.6
Advanced Additive P/W	1.1	0.5	0.3	2.7	0.9
Total Part/Whole	*9.0*	*4.6*	*2.9*	*16.6*	*7.5*
Finally					
Emergent	1.4	3.8	3.6	1.2	2.2
1:1 Counting	4.7	9.4	10.6	4.2	6.5
Count from 1 (materials)	18.9	24.7	28.1	14.2	21.1
Count from 1 (imaging)	15.5	17.5	18.4	11.8	16.2
Advanced Counting	31.8	27.0	27.9	31.5	30.2
Early Additive P/W	22.7	14.7	10.0	28.3	19.5
Advanced Additive P/W	5.0	3.0	1.3	8.7	4.3
Total Part/Whole	*27.7*	*17.7*	*11.3*	*37.0*	*23.8*
Improvement					
Advanced Additive P/W	***3.9***	***2.5***	***1.0***	***6.0***	***3.4***
Total Part/Whole	***18.7***	***13.1***	***8.4***	***20.4***	***16.3***

Table C2. Percentage of ENP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=12079)*	*(n=12543)*	*(n=8091)*	*(n=17198)*	*(n=16004)*
Emergent	17.9	10.3	7.6	13.1	11.8
1:1 Counting	19.6	18.8	14.4	18.2	17.8
Count from 1 (materials)	27.7	26.2	22.8	24.1	27.7
Count from 1 (imaging)	11.1	12.8	12.3	11.9	12.1
Advanced Counting	18.9	25.0	30.2	23.5	24.7
Early Additive P/W	4.5	6.0	10.9	7.9	5.2
Advanced Additive P/W	0.3	0.9	1.8	1.2	0.6
Total Part/Whole	*4.8*	*6.9*	*12.7*	*9.1*	*5.8*
Finally					
Emergent	3.8	1.6	0.9	2.5	1.9
1:1 Counting	9.2	6.0	3.3	6.9	6.0
Count from 1 (materials)	25.0	20.9	15.3	20.6	21.7
Count from 1 (imaging)	17.6	16.6	13.6	15.6	16.8
Advanced Counting	27.4	30.9	33.2	28.1	32.4
Early Additive P/W	14.5	19.9	26.5	20.9	18.0
Advanced Additive P/W	2.6	4.1	7.1	5.4	3.1
Total Part/Whole	*17.1*	*24.0*	*33.6*	*26.3*	*21.1*
Improvement					
Advanced Additive P/W	***2.3***	***3.2***	***5.3***	***4.2***	***2.5***
Total Part/Whole	***12.3***	***17.1***	***20.9***	***17.2***	***15.3***

Table C3. Percentage of ENP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level & Gender

		School Decile Level	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)
BOYS			
Boys Initially	*(n=6328)*	*(n=6391)*	*(n=4261)*
Emergent	18.7	11.1	7.6
1:1 Counting	20.0	19.1	14.3
Count from 1 (materials)	26.0	24.4	21.5
Count from 1 (imaging)	11.0	12.6	12.3
Advanced Counting	18.8	24.2	29.1
Early Additive P/W	5.2	7.4	12.8
Advanced Additive P/W	0.4	1.2	2.4
Total Part/Whole	*5.6*	*8.6*	*15.2*
Boys Finally			
Emergent	4.2	1.8	0.9
1:1 Counting	9.7	6.4	3.3
Count from 1 (materials)	24.1	20.8	15.1
Count from 1 (imaging)	17.3	15.5	13.5
Advanced Counting	26.2	28.7	29.8
Early Additive P/W	15.2	21.7	28.3
Advanced Additive P/W	3.3	5.1	9.0
Total Part/Whole	*18.5*	*26.8*	*37.3*
GIRLS			
Girls Initially	*(n=5751)*	*(n=6152)*	*(n=3830)*
Emergent	17.0	9.5	7.6
1:1 Counting	19.2	18.4	14.5
Count from 1 (materials)	29.7	28.2	24.2
Count from 1 (imaging)	11.2	13.0	12.3
Advanced Counting	19.0	25.8	31.4
Early Additive P/W	3.7	4.6	8.7
Advanced Additive P/W	0.3	0.5	1.2
Total Part/Whole	*4.0*	*5.1*	*9.9*
Girls Finally			
Emergent	3.3	1.3	0.9
1:1 Counting	8.6	5.5	3.3
Count from 1 (materials)	26.0	21.1	15.4
Count from 1 (imaging)	17.9	17.7	13.7
Advanced Counting	28.7	33.2	37.1
Early Additive P/W	13.6	18.1	24.6
Advanced Additive P/W	1.9	3.1	5.0
Total Part/Whole	*15.5*	*21.2*	*29.6*
Improvement			
Boys			
Advanced Additive P/W	***2.9***	***3.9***	***6.6***
Total Part/Whole	***12.9***	***18.2***	***22.1***
Girls			
Advanced Additive P/W	***1.6***	***2.6***	***3.8***
Total Part/Whole	***11.5***	***16.1***	***19.7***

Table C4. Percentage of ENP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity and Gender

Stage	NZ Eur	Māori	Pasifika	Asian
BOYS				
Boys Initially	*(n=9965)*	*(n=4089)*	*(n=1843)*	*(n=730)*
Emergent	9.1	18.3	23.4	10.3
1:1 Counting	17.3	19.5	22.8	12.9
Count from 1 (materials)	24.1	25.1	24.1	19.6
Count from 1 (imaging)	12.2	12.3	10.5	10.8
Advanced Counting	26.0	19.5	16.3	27.1
Early Additive P/W	9.7	4.7	2.4	15.9
Advanced Additive P/W	1.5	0.6	0.4	3.4
Total Part/Whole	*11.2*	*5.3*	*2.8*	*19.3*
Boys Finally				
Emergent	1.5	4.0	4.3	1.2
1:1 Counting	4.9	9.8	11.7	4.4
Count from 1 (materials)	18.7	23.5	26.9	14.5
Count from 1 (imaging)	14.7	17.1	18.6	11.8
Advanced Counting	29.1	26.0	27.0	28.1
Early Additive P/W	24.6	15.9	9.9	29.6
Advanced Additive P/W	6.5	3.6	1.5	10.4
Total Part/Whole	*31.1*	*19.5*	*11.4*	*40.0*
GIRLS				
Girls Initially	*(n=9522)*	*(n=3587)*	*(n=1711)*	*(n=633)*
Emergent	8.6	16.8	19.7	9.5
1:1 Counting	16.6	20.0	20.6	13.3
Count from 1 (materials)	27.3	29.7	28.8	20.9
Count from 1 (imaging)	12.9	10.6	11.3	11.5
Advanced Counting	27.9	19.1	16.7	31.4
Early Additive P/W	6.0	3.4	2.7	11.5
Advanced Additive P/W	0.7	0.4	0.2	1.9
Total Part/Whole	*6.7*	*3.8*	*2.9*	*13.4*
Girls Finally				
Emergent	1.3	3.5	2.8	1.3
1:1 Counting	4.5	8.9	9.4	3.9
Count from 1 (materials)	19.1	26.0	29.5	13.9
Count from 1 (imaging)	16.4	17.9	18.3	11.8
Advanced Counting	34.6	28.2	28.9	35.5
Early Additive P/W	20.7	13.3	10.1	26.9
Advanced Additive P/W	3.5	2.3	1.1	6.6
Total Part/Whole	*24.2*	*15.6*	*11.2*	*33.5*
Improvement				
Boys				
Advanced Additive P/W	***5.0***	***3.0***	***1.1***	***7.0***
Total Part/Whole	***19.9***	***14.2***	***8.6***	***20.7***
Girls				
Advanced Additive P/W	***2.8***	***1.9***	***0.9***	***4.7***
Total Part/Whole	***17.5***	***11.8***	***8.3***	***20.1***

Table C5. Percentage of ENP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity and School Decile

		Ethnicity		
Stage	NZ Eur	Māori	Pasifika	Asian
	LOW DECILE			
Low Decile Initially	*(n=3694)*	*(n=4661)*	*(n=2857)*	*(n=384)*
Emergent	12.6	19.8	22.2	13.3
1:1 Counting	18.5	19.5	21.5	15.6
Count from 1 (materials)	28.9	27.6	26.6	25.3
Count from 1 (imaging)	11.9	11.0	10.9	11.7
Advanced Counting	21.1	18.2	16.2	25.5
Early Additive P/W	6.6	3.5	2.4	7.8
Advanced Additive P/W	0.5	0.3	0.2	0.8
Total Part/Whole	*7.1*	*3.8*	*2.6*	*8.6*
Low Decile Finally				
Emergent	2.6	4.8	3.9	1.6
1:1 Counting	7.0	10.1	10.9	6.8
Count from 1 (materials)	22.3	25.5	28.6	17.7
Count from 1 (imaging)	16.9	17.6	18.9	13.5
Advanced Counting	28.9	25.9	27.1	34.9
Early Additive P/W	18.7	13.6	9.5	21.4
Advanced Additive P/W	3.6	2.4	1.2	4.2
Total Part/Whole	*22.3*	*16.0*	*10.7*	*25.6*
	MEDIUM DECILE			
Medium Decile Initially	*(n=8999)*	*(n=2367)*	*(n=545)*	*(n=317)*
Emergent	8.7	14.3	18.7	8.5
1:1 Counting	18.1	20.7	21.1	18.6
Count from 1 (materials)	26.1	27.4	27.5	21.5
Count from 1 (imaging)	12.9	12.7	11.0	12.0
Advanced Counting	26.7	19.8	18.0	28.1
Early Additive P/W	6.5	4.6	3.1	9.5
Advanced Additive P/W	1.0	0.5	0.6	1.9
Total Part/Whole	*7.5*	*5.1*	*3.7*	*11.4*
Medium Decile Finally				
Emergent	1.3	2.1	2.6	1.9
1:1 Counting	4.9	9.0	10.1	3.8
Count from 1 (materials)	20.3	23.2	23.5	16.7
Count from 1 (imaging)	16.3	17.9	17.1	13.6
Advanced Counting	31.5	28.0	32.8	31.9
Early Additive P/W	21.5	15.9	12.1	23.7
Advanced Additive P/W	4.2	3.8	1.8	8.5
Total Part/Whole	*25.7*	*19.7*	*13.9*	*32.2*

Table C5 (continued). Percentage of ENP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity and School Decile

		Ethnicity		
Stage	NZ Eur	Māori	Pasifika	Asian
	HIGH DECILE			
High Decile Initially	*(n=6515)*	*(n=520)*	*(n=98)*	*(n=651)*
Emergent	7.2	9.6	15.3	8.8
1:1 Counting	14.4	18.5	29.6	8.9
Count from 1 (materials)	23.3	24.4	19.4	16.6
Count from 1 (imaging)	12.5	11.7	11.2	10.3
Advanced Counting	30.4	28.5	16.3	31.5
Early Additive P/W	10.6	6.3	5.1	19.7
Advanced Additive P/W	1.6	1.0	3.1	4.3
Total Part/Whole	*12.2*	*7.3*	*8.2*	*24.0*
High Decile Finally				
Emergent	0.8	1.7	1.0	0.8
1:1 Counting	3.2	4.8	4.1	2.9
Count from 1 (materials)	15.0	20.6	29.6	11.1
Count from 1 (imaging)	13.7	14.2	16.3	10.1
Advanced Counting	33.5	34.8	30.6	29.2
Early Additive P/W	26.7	20.0	15.3	34.4
Advanced Additive P/W	7.1	3.8	3.1	11.5
Total Part/Whole	*33.8*	*23.8*	*18.4*	*45.9*
Improvement				
Low Decile				
Advanced Additive P/W	***3.1***	***2.1***	***1.0***	***3.4***
Total Part/Whole	***15.2***	***12.2***	***8.1***	***17.0***
Medium Decile				
Advanced Additive P/W	***3.2***	***3.3***	***1.2***	***6.6***
Total Part/Whole	***18.2***	***14.6***	***10.2***	***20.8***
High Decile				
Advanced Additive P/W	***5.5***	***2.8***	***0.0***	***7.2***
Total Part/Whole	***21.6***	***16.5***	***10.2***	***21.9***

Table C6. Percentage of ENP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=12416)*	*(n=4576)*	*(n=2121)*	*(n=1004)*	*(n=20929)*
Emergent	8.7	13.6	16.3	9.1	10.8
1:1 Counting	14.5	17.3	19.4	9.9	15.4
Count from 1 (materials)	30.4	34.5	33.0	27.5	31.4
Count from 1 (imaging)	11.0	8.6	10.1	12.0	10.4
Advanced Counting	28.0	22.7	19.7	30.1	26.3
Early Additive P/W	6.5	3.1	1.4	9.9	5.4
Advanced Additive P/W	0.5	0.1	0.1	1.7	0.5
Total Part/Whole	*7.0*	*3.2*	*1.5*	*11.6*	*5.9*
Finally					
Emergent	1.9	3.5	3.3	0.9	2.4
1:1 Counting	4.8	7.3	8.0	3.9	5.6
Count from 1 (materials)	21.3	28.4	31.1	17.9	23.7
Count from 1 (imaging)	13.5	16.0	17.6	15.9	14.5
Advanced Counting	36.3	31.5	31.8	35.3	34.8
Early Additive P/W	19.9	12.1	8.0	21.3	16.9
Advanced Additive P/W	2.3	1.2	0.2	4.8	2.0
Total Part/Whole	*22.2*	*13.3*	*8.2*	*26.1*	*18.9*
Improvement					
Advanced Additive P/W	***1.8***	***1.1***	***0.1***	***3.1***	***1.5***
Total Part/Whole	***15.2***	***10.1***	***6.7***	***15.5***	***11.1***

Table C7. Percentage of ENP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=7221)*	*(n=7305)*	*(n=5553)*	*(n=10624)*	*(n=10305)*
Emergent	12.9	10.5	8.7	11.5	10.0
1:1 Counting	16.9	15.2	14.4	14.9	15.9
Count from 1 (materials)	34.1	30.5	29.8	30.4	32.4
Count from 1 (imaging)	8.9	11.7	10.4	10.2	10.5
Advanced Counting	23.5	26.0	29.4	25.5	27.1
Early Additive P/W	3.4	5.9	6.6	6.8	3.9
Advanced Additive P/W	0.2	0.3	0.7	0.7	0.2
Total Part/Whole	*3.6*	*6.2*	*7.3*	*7.5*	*4.1*
Finally					
Emergent	2.9	2.6	1.7	2.5	2.3
1:1 Counting	6.8	6.0	3.9	6.0	5.3
Count from 1 (materials)	28.0	22.7	19.4	22.9	24.7
Count from 1 (imaging)	15.6	14.2	14.0	14.0	15.1
Advanced Counting	33.3	34.9	36.9	33.1	36.6
Early Additive P/W	12.3	17.6	21.1	18.7	15.0
Advanced Additive P/W	1.1	2.0	3.1	2.9	1.1
Total Part/Whole	*13.4*	*19.6*	*24.2*	*21.6*	*16.1*
Improvement					
Advanced Additive P/W	***0.9***	***1.7***	***2.4***	***2.2***	***0.9***
Total Part/Whole	***9.8***	***13.4***	***16.9***	***14.1***	***12.1***

Table C8. Percentage of ENP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level

		School Decile Level	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)
BOYS			
Boys Initially	*(n=3653)*	*(n=3720)*	*(n=2849)*
Emergent	13.5	11.1	9.6
1:1 Counting	16.4	15.0	13.7
Count from 1 (materials)	33.1	29.7	28.9
Count from 1 (imaging)	9.4	11.5	9.5
Advanced Counting	23.2	24.9	28.3
Early Additive P/W	4.1	7.3	9.0
Advanced Additive P/W	0.3	0.5	1.1
Total Part/Whole	*4.4*	*7.8*	*10.1*
Boys Finally			
Emergent	3.0	2.7	2.0
1:1 Counting	7.3	6.5	4.0
Count from 1 (materials)	27.2	21.5	19.0
Count from 1 (imaging)	15.3	13.3	13.3
Advanced Counting	32.3	33.4	33.8
Early Additive P/W	13.4	19.8	23.4
Advanced Additive P/W	1.5	2.8	4.6
Total Part/Whole	*14.9*	*22.6*	*28.0*
GIRLS			
Girls Initially	*(n=3568)*	*(n=3583)*	*(n=2703)*
Emergent	12.3	9.8	7.8
1:1 Counting	17.3	15.3	15.2
Count from 1 (materials)	35.3	31.4	30.9
Count from 1 (imaging)	8.4	11.9	11.3
Advanced Counting	23.9	27.0	30.5
Early Additive P/W	2.7	4.4	4.0
Advanced Additive P/W	0.1	0.1	0.3
Total Part/Whole	*2.8*	*4.5*	*4.3*
Girls Finally			
Emergent	2.9	2.5	1.4
1:1 Counting	6.3	5.6	3.8
Count from 1 (materials)	28.8	23.8	19.8
Count from 1 (imaging)	15.9	15.0	14.8
Advanced Counting	34.3	36.5	40.1
Early Additive P/W	11.2	15.5	18.7
Advanced Additive P/W	0.6	1.2	1.5
Total Part/Whole	*11.8*	*16.7*	*20.2*
Improvement			
Boys			
Advanced Additive P/W	***1.2***	***2.3***	***3.5***
Total Part/Whole	***10.5***	***14.8***	***18.1***
Girls			
Advanced Additive P/W	***0.5***	***1.1***	***1.2***
Total Part/Whole	***9.0***	***12.2***	***15.9***

Table C9. Percentage of ENP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity and Gender

		Ethnicity		
Stage	NZ Eur	Māori	Pasifika	Asian
BOYS				
Boys Initially	*(n=6257)*	*(n=2378)*	*(n=1061)*	*(n=507)*
Emergent	9.2	14.9	17.0	10.7
1:1 Counting	13.9	16.5	20.0	8.7
Count from 1 (materials)	29.5	33.5	32.0	25.4
Count from 1 (imaging)	10.5	9.0	10.8	11.6
Advanced Counting	27.6	22.1	18.4	30.8
Early Additive P/W	8.5	3.8	1.7	10.8
Advanced Additive P/W	0.8	0.2	0.2	2.0
Total Part/Whole	*9.3*	*4.0*	*1.9*	*12.8*
Boys Finally				
Emergent	2.2	3.4	3.5	0.4
1:1 Counting	5.0	8.1	7.8	5.3
Count from 1 (materials)	19.9	28.0	30.9	17.4
Count from 1 (imaging)	13.0	15.3	17.9	13.8
Advanced Counting	34.2	30.5	31.0	34.9
Early Additive P/W	22.3	13.0	8.6	22.5
Advanced Additive P/W	3.4	1.8	0.3	5.7
Total Part/Whole	*25.7*	*14.8*	*8.9*	*28.2*
GIRLS				
Girls Initially	*(n=6160)*	*(n=2199)*	*(n=1060)*	*(n=497)*
Emergent	8.2	12.3	15.7	7.4
1:1 Counting	15.1	18.1	18.8	11.1
Count from 1 (materials)	31.4	35.7	34.1	29.6
Count from 1 (imaging)	11.5	8.2	9.4	12.3
Advanced Counting	29.2	23.3	20.9	29.4
Early Additive P/W	4.4	2.4	1.1	8.9
Advanced Additive P/W	0.2	0.0	-	1.4
Total Part/Whole	*4.6*	*2.4*	*1.1*	*10.3*
Girls Finally				
Emergent	1.6	3.6	3.1	1.4
1:1 Counting	4.5	6.5	8.2	2.4
Count from 1 (materials)	22.6	28.8	31.3	18.5
Count from 1 (imaging)	14.1	16.7	17.3	18.1
Advanced Counting	38.6	32.7	32.6	35.6
Early Additive P/W	17.4	11.1	7.4	20.1
Advanced Additive P/W	1.2	0.5	0.1	3.8
Total Part/Whole	*18.6*	*11.6*	*7.5*	*23.9*
Improvement				
Boys				
Advanced Additive P/W	***2.6***	***1.6***	***0.1***	***3.7***
Total Part/Whole	***16.4***	***10.8***	***7.0***	***15.4***
Girls				
Advanced Additive P/W	***1.0***	***0.5***	***0.1***	***2.4***
Total Part/Whole	***14.0***	***9.2***	***6.4***	***13.6***

Table C10. Percentage of ENP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity and School Decile

Stage	NZ Eur	Māori	Pasifika	Asian
	LOW DECILE			
Low Decile Initially	*(n=2144)*	*(n=2969)*	*(n=1654)*	*(n=203)*
Emergent	9.8	13.1	16.3	11.3
1:1 Counting	13.8	17.4	20.6	9.9
Count from 1 (materials)	34.1	35.7	32.9	29.6
Count from 1 (imaging)	9.1	7.7	10.5	11.3
Advanced Counting	26.9	23.2	18.8	29.6
Early Additive P/W	6.0	2.6	1.0	7.9
Advanced Additive P/W	0.3	0.1	0.1	0.5
Total Part/Whole	*6.3*	*2.7*	*1.1*	*8.4*
Low Decile Finally				
Emergent	2.3	3.4	3.0	1.5
1:1 Counting	5.4	7.2	8.1	5.4
Count from 1 (materials)	24.2	29.0	31.7	22.7
Count from 1 (imaging)	13.2	16.5	18.0	11.3
Advanced Counting	36.0	31.3	32.3	36.9
Early Additive P/W	17.4	11.5	6.8	19.2
Advanced Additive P/W	1.6	1.0	0.1	3.0
Total Part/Whole	*19.0*	*12.5*	*6.9*	*22.2*
	MEDIUM DECILE			
Medium Decile Initially	*(n=4981)*	*(n=1257)*	*(n=330)*	*(n=417)*
Emergent	8.9	15.5	18.8	7.4
1:1 Counting	15.1	16.9	17.0	10.6
Count from 1 (materials)	29.6	32.9	33.9	29.5
Count from 1 (imaging)	12.2	10.7	9.1	11.8
Advanced Counting	27.5	20.5	19.4	30.5
Early Additive P/W	6.4	3.6	1.8	9.4
Advanced Additive P/W	0.4	-	-	1.0
Total Part/Whole	*6.8*	*3.6*	*1.8*	*10.4*
Medium Decile Finally				
Emergent	2.0	4.5	5.5	0.7
1:1 Counting	5.6	8.2	8.2	4.1
Count from 1 (materials)	21.4	27.4	30.0	17.0
Count from 1 (imaging)	13.5	15.4	17.6	17.3
Advanced Counting	35.9	31.3	29.1	36.9
Early Additive P/W	19.5	12.2	9.7	18.9
Advanced Additive P/W	2.1	1.1	-	5.0
Total Part/Whole	*21.6*	*13.3*	*9.7*	*23.9*

Table C10 (continued). Percentage of ENP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity and School Decile

Stage	NZ Eur	Māori	Pasifika	Asian
	HIGH DECILE			
High Decile Initially	*(n=4739)*	*(n=282)*	*(n=69)*	*(n=264)*
Emergent	8.2	12.1	18.8	9.8
1:1 Counting	14.7	19.5	8.7	9.1
Count from 1 (materials)	30.3	27.3	29.0	25.8
Count from 1 (imaging)	10.4	10.3	10.1	11.4
Advanced Counting	29.5	25.2	27.5	31.1
Early Additive P/W	6.3	5.0	4.3	11.0
Advanced Additive P/W	0.6	0.7	1.4	1.9
Total Part/Whole	*6.9*	*5.7*	*5.7*	*12.9*
High Decile Finally				
Emergent	1.7	1.4	4.3	1.1
1:1 Counting	3.7	5.7	7.2	2.7
Count from 1 (materials)	19.4	25.9	20.3	14.8
Count from 1 (imaging)	13.9	14.2	14.5	16.3
Advanced Counting	37.4	31.6	33.3	33.3
Early Additive P/W	21.0	18.1	17.4	26.9
Advanced Additive P/W	2.9	3.2	2.9	4.9
Total Part/Whole	*23.9*	*21.3*	*20.3*	*31.8*
Improvement				
Low Decile				
Advanced Additive P/W	***1.3***	***0.9***	***0.0***	***2.5***
Total Part/Whole	***12.7***	***9.7***	***5.8***	***13.8***
Medium Decile				
Advanced Additive P/W	***1.7***	***1.1***	***0.0***	***4.0***
Total Part/Whole	***14.8***	***9.7***	***7.9***	***13.5***
High Decile				
Advanced Additive P/W	***2.3***	***2.5***	***1.5***	***3.0***
Total Part/Whole	***17.0***	***15.6***	***14.6***	***18.9***

Table C11. Percentage of ENP students in 2003 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=32824)*	*(n=12304)*	*(n=5939)*	*(n=2820)*	*(n=56257)*
Emergent	6.3	11.4	12.8	6.5	8.2
1:1 Counting	14.3	17.0	17.7	10.4	15.0
Count from 1 (materials)	35.5	38.1	38.3	31.0	36.1
Count from 1 (imaging)	11.3	10.4	12.1	12.1	11.2
Advanced Counting	26.1	19.8	17.3	28.8	23.9
Early Additive P/W	6.3	3.1	1.8	10.2	5.3
Advanced Additive P/W	0.3	0.1	0.1	1.0	0.3
Total Part/Whole	*6.6*	*3.2*	*1.9*	*11.2*	*5.6*
Finally					
Emergent	1.3	2.5	2.5	0.9	1.7
1:1 Counting	3.7	6.0	5.7	3.0	4.4
Count from 1 (materials)	21.7	28.8	30.7	16.7	23.9
Count from 1 (imaging)	14.6	16.5	19.4	14.0	15.5
Advanced Counting	36.5	33.1	32.3	36.3	35.4
Early Additive P/W	20.1	11.9	9.0	24.9	17.3
Advanced Additive P/W	2.2	1.1	0.4	4.1	1.9
Total Part/Whole	*22.3*	*13.0*	*9.4*	*29.0*	*19.2*
Improvement					
Advanced Additive P/W	***1.9***	***1.0***	***0.3***	***3.1***	***1.6***
Total Part/Whole	***15.7***	***9.8***	***7.5***	***17.8***	***13.6***

Table C12. Percentage of ENP students in 2003 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=18908)*	*(n=19723)*	*(n=16331)*	*(n=28620)*	*(n=27635)*
Emergent	11.0	7.8	5.3	8.9	7.4
1:1 Counting	16.7	15.1	13.0	14.8	15.2
Count from 1 (materials)	37.5	36.3	34.7	35.3	36.9
Count from 1 (imaging)	11.2	11.3	11.1	10.8	11.6
Advanced Counting	20.4	23.9	27.7	22.9	25.0
Early Additive P/W	3.0	5.5	7.7	6.8	3.9
Advanced Additive P/W	0.1	0.2	0.5	0.4	0.1
Total Part/Whole	*3.1*	*5.7*	*8.2*	*7.2*	*4.0*
Finally					
Emergent	2.4	1.5	1.1	1.8	1.5
1:1 Counting	5.4	4.7	2.8	4.7	4.0
Count from 1 (materials)	28.2	24.0	18.9	23.5	24.4
Count from 1 (imaging)	17.2	15.0	14.1	14.9	16.1
Advanced Counting	34.0	35.5	36.8	33.0	37.8
Early Additive P/W	11.9	17.5	23.3	19.2	15.2
Advanced Additive P/W	0.9	1.8	3.1	2.8	0.9
Total Part/Whole	*12.8*	*19.3*	*26.4*	*22.0*	*16.1*
Improvement					
Advanced Additive P/W	***0.8***	***1.6***	***2.6***	***2.4***	***0.8***
Total Part/Whole	***9.7***	***13.6***	***18.2***	***14.8***	***12.1***

Table C13. Percentage of ANP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=5139)*	*(n=1471)*	*(n=770)*	*(n=483)*	*(n=8094)*
Counting from one	6.2	8.4	13.0	4.3	7.3
Advanced Counting	38.0	49.6	54.0	27.7	40.9
Early Additive P/W	39.1	31.8	26.6	39.1	36.5
Advanced Additive P/W	16.7	10.1	6.4	28.8	15.4
Total Part/Whole	*55.8*	*41.9*	*33.0*	*67.9*	*51.9*
Finally					
Counting from one	1.5	1.8	1.7	1.2	1.6
Advanced Counting	16.2	24.4	34.8	11.0	19.1
Early Additive P/W	42.0	45.0	42.7	34.6	42.1
Advanced Additive P/W	40.2	28.8	20.8	53.2	37.1
Total Part/Whole	*82.2*	*73.8*	*63.5*	*87.8*	*79.2*
Improvement					
Advanced Additive P/W	***23.5***	***18.7***	***14.4***	***24.4***	***21.7***
Total Part/Whole	***26.4***	***31.9***	***30.5***	***19.9***	***27.3***

Table C14. Percentage of ANP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=3115)*	*(n=3187)*	*(n=1792)*	*(n=4169)*	*(n=3925)*
Counting from one	8.9	8.0	3.1	7.3	7.2
Advanced Counting	47.2	40.5	30.7	37.1	44.9
Early Additive P/W	32.0	36.0	45.0	36.2	36.8
Advanced Additive P/W	11.9	15.5	21.1	19.4	11.0
Total Part/Whole	*43.9*	*51.5*	*66.1*	*55.6*	*47.8*
Finally					
Counting from one	1.8	1.9	0.8	1.4	1.9
Advanced Counting	24.3	18.7	11.0	18.2	20.1
Early Additive P/W	42.6	42.7	40.2	38.4	46.1
Advanced Additive P/W	31.3	36.7	47.9	42.0	31.9
Total Part/Whole	*73.9*	*79.4*	*88.1*	*80.4*	*78.0*
Improvement					
Advanced Additive P/W	***19.4***	***21.2***	***26.8***	***22.6***	***20.9***
Total Part/Whole	***30.0***	***27.9***	***22.0***	***24.8***	***30.2***

Table C15. Percentage of ANP students in 2001 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=5139)*	*(n=1471)*	*(n=770)*	*(n=483)*	*(n=8094)*
Counting from one	12.1	18.7	29.7	10.6	15.1
Advanced Counting	37.0	43.7	42.6	25.9	37.9
Early Additive P/W	30.6	27.5	19.6	27.5	28.7
Advanced Additive P/W	16.0	8.1	6.8	25.1	14.2
Adv Multiplicative P/W	4.3	2.0	1.3	11.0	4.0
Total Part/Whole	*50.9*	*37.6*	*27.7*	*63.6*	*46.9*
Finally					
Counting from one	3.0	4.8	9.2	2.3	4.0
Advanced Counting	20.8	30.0	38.3	14.7	23.7
Early Additive P/W	32.9	37.0	31.4	27.7	33.2
Advanced Additive P/W	28.0	20.6	15.6	29.6	25.6
Adv Multiplicative P/W	15.4	7.5	5.5	25.7	13.6
Total Part/Whole	*76.3*	*65.1*	*52.5*	*83.0*	*72.4*
Improvement					
Adv Multiplicative P/W	***11.1***	***5.5***	***4.2***	***14.7***	***9.6***
Adv Additive P/W	***12.0***	***12.5***	***8.8***	***4.5***	***11.4***
Total Part/Whole	***25.4***	***27.5***	***24.8***	***19.4***	***25.5***

Table C16. Percentage of ANP students in 2001 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=3115)*	*(n=3187)*	*(n=1792)*	*(n=4169)*	*(n=3925)*
Counting from one	19.9	14.9	7.1	15.0	15.2
Advanced Counting	41.4	39.4	29.1	36.1	39.8
Early Additive P/W	26.6	27.3	34.9	27.6	30.0
Advanced Additive P/W	9.8	14.1	22.1	16.0	12.4
Adv Multiplicative P/W	2.3	4.2	6.8	5.4	2.6
Total Part/Whole	*38.7*	*45.6*	*63.8*	*49.0*	*45.0*
Finally					
Counting from one	5.2	4.0	1.8	3.9	4.0
Advanced Counting	28.9	24.6	12.9	22.4	25.0
Early Additive P/W	34.5	32.8	31.7	31.0	35.6
Advanced Additive P/W	21.8	25.7	32.0	26.1	25.0
Adv Multiplicative P/W	9.6	12.9	21.6	16.6	10.3
Total Part/Whole	*65.9*	*71.4*	*85.3*	*73.7*	*70.9*
Improvement					
AdvMultiplicative P/W	***7.3***	***8.7***	***14.8***	***11.2***	***7.7***
Adv Additive P/W	***12.0***	***11.6***	***9.9***	***10.1***	***12.6***
Total Part/Whole	***27.2***	***25.8***	***21.5***	***24.7***	***25.9***

Table C17. Percentage of ANP students in 2001 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity

			Ethnicity		
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=5139)*	*(n=1471)*	*(n=770)*	*(n=483)*	*(n=8094)*
Counting from one	15.9	26.9	45.8	18.4	21.1
Advanced Counting	32.9	37.5	28.3	25.1	32.8
Early Additive P/W	36.1	29.1	20.1	30.4	32.8
Advanced Additive P/W	9.9	4.2	4.5	13.0	8.5
Adv Multiplicative P/W	4.8	2.3	1.0	11.6	4.4
Adv Proportional P/W	0.4	0.1	0.1	1.4	0.4
Total Part/Whole	*51.2*	*35.7*	*25.7*	*56.4*	*46.1*
Finally					
Counting from one	4.7	7.4	19.2	5.2	6.6
Advanced Counting	20.9	29.8	35.6	17.4	23.9
Early Additive P/W	38.5	42.7	30.9	32.5	38.0
Advanced Additive P/W	20.4	13.1	9.1	18.8	18.0
Adv Multiplicative P/W	13.3	5.6	4.4	20.3	11.4
Adv Proportional P/W	2.2	1.4	0.8	5.8	2.2
Total Part/Whole	*74.4*	*62.8*	*45.2*	*77.4*	*69.6*
Improvement					
AdvProportional P/W	***1.8***	***1.3***	***0.7***	***4.4***	***1.8***
Adv Multiplicative P/W	***8.5***	***3.3***	***3.4***	***8.7***	***7.0***
Adv Additive P/W10.5	***10.5***	***8.9***	***4.6***	***5.8***	***10.5***
Total Part/Whole	***23.2***	***27.1***	***19.5***	***21.0***	***23.5***

Table C18. Percentage of ANP students in 2001 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			**Gender**	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=3115)*	*(n=3187)*	*(n=1792)*	*(n=4169)*	*(n=3925)*
Counting from one	29.2	20.2	8.6	20.6	21.7
Advanced Counting	33.9	35.9	25.4	31.2	34.6
Early Additive P/W	28.3	30.8	43.8	33.0	32.5
Advanced Additive P/W	6.2	8.4	12.9	9.1	8.0
Adv Multiplicative P/W	2.2	4.2	8.6	5.6	3.1
Adv Proportional P/W	0.2	0.4	0.7	0.6	0.2
Total Part/Whole	*36.9*	*43.8*	*66.0*	*48.3*	*43.8*
Finally					
Counting from one	9.6	6.5	1.8	6.8	6.5
Advanced Counting	26.9	27.5	12.1	22.1	25.7
Early Additive P/W	40.5	34.6	39.5	37.0	39.0
Advanced Additive P/W	14.9	17.7	23.8	18.0	17.9
Adv Multiplicative P/W	6.3	11.5	19.9	13.1	9.5
Adv Proportional P/W	1.9	2.1	2.8	3.0	1.3
Total Part/Whole	*63.6*	*65.9*	*86.0*	*71.1*	*67.7*
Improvement					
Adv Proportional P/W	***1.7***	***1.7***	***2.1***	***2.4***	***1.1***
Adv Multiplicative P/W	***4.1***	***7.3***	***11.3***	***7.5***	***6.4***
Adv Additive P/W	***8.7***	***9.3***	***10.9***	***8.9***	***9.9***
Total Part/Whole	***26.7***	***22.1***	***20.0***	***22.8***	***23.9***

Table C19. Percentage of ANP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=19600)*	*(n=8037)*	*(n=3193)*	*(n=1700)*	*(n=34035)*
Counting from one	6.2	13.0	17.7	5.0	9.0
Advanced Counting	39.0	49.2	55.7	32.0	42.7
Early Additive P/W	41.4	32.3	22.3	38.3	37.0
Advanced Additive P/W	13.5	5.5	4.3	24.7	11.3
Total Part/Whole	*54.9*	*37.8*	*26.6*	*63.0*	*48.3*
Finally					
Counting from one	3.0	6.6	9.6	2.9	4.6
Advanced Counting	17.8	28.1	38.4	15.8	22.2
Early Additive P/W	50.0	49.9	42.1	41.3	48.7
Advanced Additive P/W	29.1	15.4	10.0	40.1	24.5
Total Part/Whole	*79.1*	*65.3*	*52.1*	*81.4*	*73.2*
Improvement					
Advanced Additive P/W	***15.6***	***9.9***	***5.7***	***15.4***	***13.2***
Total Part/Whole	***24.2***	***27.5***	***25.5***	***18.4***	***24.9***

Table C20. Percentage of ANP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=11397)*	*(n=12451)*	*(n=8656)*	*(n=17575)*	*(n=16460)*
Counting from one	13.4	7.7	4.6	9.3	8.6
Advanced Counting	49.9	42.1	34.9	37.8	47.9
Early Additive P/W	30.1	39.5	43.5	38.3	35.6
Advanced Additive P/W	6.7	10.7	17.1	14.5	7.9
Total Part/Whole	*36.8*	*50.2*	*60.6*	*52.8*	*43.5*
Finally					
Counting from one	7.1	4.0	1.7	4.7	4.4
Advanced Counting	29.8	20.6	14.4	19.8	24.9
Early Additive P/W	46.9	50.2	49.7	46.9	50.6
Advanced Additive P/W	16.1	25.2	34.2	28.6	20.1
Total Part/Whole	*63.0*	*75.4*	*83.9*	*75.5*	*70.7*
Improvement					
Advanced Additive P/W	***9.4***	***14.5***	***17.1***	***14.1***	***12.2***
Total Part/Whole	***26.2***	***25.2***	***23.3***	***22.7***	***27.2***

Table C21. Percentage of ANP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level & Gender

		School Decile Level	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)
GIRLS			
Girls Initially	*(n=5515)*	*(n=6057)*	*(n=4137)*
Counting from one	12.7	7.1	4.8
Advanced Counting	53.2	48.0	41.6
Early Additive P/W	29.0	37.5	42.2
Advanced Additive P/W	5.0	7.4	11.4
Total Part/Whole	*34.0*	*44.9*	*53.6*
Girls Finally			
Counting from one	6.9	3.8	1.7
Advanced Counting	31.6	23.7	17.3
Early Additive P/W	47.5	52.0	53.6
Advanced Additive P/W	14.0	20.5	27.4
Total Part/Whole	*61.5*	*72.5*	*81.0*
BOYS			
Boys Initially	*(n=5882)*	*(n=6394)*	*(n=4519)*
Counting from one	14.0	8.3	4.4
Advanced Counting	46.7	36.5	28.7
Early Additive P/W	31.1	41.3	44.6
Advanced Additive P/W	8.2	13.9	22.3
Total Part/Whole	*39.3*	*55.2*	*66.9*
Boys Finally			
Counting from one	7.4	4.2	1.7
Advanced Counting	28.2	17.6	11.8
Early Additive P/W	46.3	48.5	46.1
Advanced Additive P/W	18.1	29.6	40.5
Total Part/Whole	*64.4*	*78.1*	*86.6*
Improvement			
Girls			
Advanced Part/Whole	***9.0***	***13.1***	***16.0***
Total Part/Whole	***27.5***	***27.6***	***27.4***
Boys			
Advanced Part/Whole	***9.9***	***15.7***	***18.2***
Total Part/Whole	***25.1***	***22.9***	***19.7***

Table C22. Percentage of ANP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity and Gender

	Ethnicity			
Stage	NZ Eur	Māori	Pasifika	Asian
	BOYS			
Boys Initially	*(n=10066)*	*(n=4233)*	*(n=1659)*	*(n=876)*
Counting from one	6.4	13.2	19.2	5.7
Advanced Counting	33.0	46.4	52.6	27.4
Early Additive P/W	42.7	33.7	23.4	37.7
Advanced Additive P/W	17.9	6.6	4.8	29.2
Total Part/Whole	*60.6*	*40.3*	*28.2*	*66.9*
Boys Finally				
Counting from one	3.0	6.8	10.5	3.7
Advanced Counting	14.6	26.8	36.9	12.7
Early Additive P/W	47.6	49.2	41.6	39.0
Advanced Additive P/W	34.8	17.2	11.0	44.6
Total Part/Whole	*82.4*	*66.4*	*52.6*	*83.6*
	GIRLS			
Girls Initially	*(n=9534)*	*(n=3804)*	*(n=1534)*	*(n=824)*
Counting from one	5.9	12.7	16.1	4.2
Advanced Counting	45.4	52.3	59.1	36.9
Early Additive P/W	39.9	30.7	21.0	39.0
Advanced Additive P/W	8.8	4.3	3.8	19.9
Total Part/Whole	*48.7*	*35.0*	*24.8*	*58.9*
Girls Finally				
Counting from one	3.0	6.3	8.6	2.1
Advanced Counting	21.2	29.5	39.9	19.1
Early Additive P/W	52.6	50.7	42.6	43.7
Advanced Additive P/W	23.1	13.5	8.9	35.2
Total Part/Whole	*75.7*	*64.2*	*51.5*	*78.9*
Improvement				
Boys				
Advanced Additive P/W	***16.9***	***10.6***	***6.2***	***15.4***
Total Part/Whole	***21.8***	***26.1***	***24.4***	***16.7***
Girls				
Advanced Additive P/W	***14.3***	***9.2***	***5.1***	***15.3***
Total Part/Whole	***27.0***	***29.2***	***26.7***	***20.0***

Table C23. Percentage of ANP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity & Decile

Stage	NZ Eur	Māori	Pasifika	Asian
	LOW DECILE			
Low Decile Initially	*(n=3466)*	*(n=4748)*	*(n=2320)*	*(n=435)*
Counting from one	8.4	14.4	18.5	9.9
Advanced Counting	44.1	51.6	56.7	41.8
Early Additive P/W	36.9	29.4	21.2	34.3
Advanced Additive P/W	10.6	4.6	3.6	14.0
Total Part/Whole	*47.5*	*34.0*	*24.8*	*48.3*
Low Decile Finally				
Counting from one	4.7	7.5	10.1	3.9
Advanced Counting	22.4	30.6	40.6	23.2
Early Additive P/W	48.8	48.9	40.8	45.5
Advanced Additive P/W	24.1	13.0	8.5	27.4
Total Part/Whole	*72.9*	*61.9*	*49.3*	*72.9*
	MEDIUM DECILE			
Medium Decile Initially	*(n=8640)*	*(n=2446)*	*(n=532)*	*(n=353)*
Counting from one	6.5	10.9	13.7	5.7
Advanced Counting	40.3	46.0	56.4	39.9
Early Additive P/W	41.2	36.5	25.4	38.2
Advanced Additive P/W	12.0	6.5	4.5	16.1
Total Part/Whole	*53.2*	*43.0*	*29.9*	*54.3*
Medium Decile Finally				
Counting from one	3.4	5.2	7.3	2.8
Advanced Counting	18.9	24.0	35.0	17.6
Early Additive P/W	50.1	52.3	45.9	43.9
Advanced Additive P/W	27.5	18.5	11.8	35.7
Total Part/Whole	*77.6*	*70.5*	*57.7*	*79.6*
	HIGH DECILE			
High Decile Initially	*(n=6710)*	*(n=569)*	*(n=117)*	*(n=724)*
Counting from one	4.6	7.0	5.1	1.9
Advanced Counting	35.1	42.7	49.6	24.2
Early Additive P/W	44.4	40.9	33.3	40.9
Advanced Additive P/W	15.9	9.3	12.0	33.0
Total Part/Whole	*60.3*	*50.2*	*45.3*	*73.9*
High Decile Finally				
Counting from one	1.5	2.3	2.6	2.1
Advanced Counting	14.0	20.9	22.2	10.9
Early Additive P/W	51.1	52.7	50.4	37.3
Advanced Additive P/W	33.4	24.1	24.8	49.7
Total Part/Whole	*84.5*	*76.8*	*75.2*	*87.0*
Improvement				
Low Decile				
Advanced Additive P/W	***13.5***	***8.4***	***4.9***	***13.4***
Total Part/Whole	***25.4***	***27.9***	***24.5***	***24.6***
Medium Decile				
Advanced Additive P/W	***15.5***	***12.0***	***7.3***	***19.6***
Total Part/Whole	***24.4***	***27.5***	***27.8***	***25.3***
High Decile				
Advanced Additive P/W	***17.5***	***14.8***	***12.8***	***16.7***
Total Part/Whole	***24.2***	***26.6***	***29.9***	***13.1***

Table C24. Percentage of ANP students in 2002 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity

Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=17792)*	*(n=6627)*	*(n=2454)*	*(n=1598)*	*(n=29767)*
Counting from one	10.1	17.5	23.1	7.8	12.7
Advanced Counting	40.6	48.8	52.2	29.9	42.8
Early Additive P/W	28.4	23.5	18.3	32.4	26.7
Advanced Additive P/W	16.6	8.8	5.3	19.8	14.1
Adv Multiplicative P/W	4.4	1.4	1.1	10.1	3.8
Total Part/Whole	*49.4*	*33.7*	*24.7*	*62.3*	*44.6*
Finally					
Counting from one	2.3	5.0	6.6	2.6	3.3
Advanced Counting	21.5	32.3	41.4	15.5	25.3
Early Additive P/W	31.4	33.9	32.0	27.7	31.9
Advanced Additive P/W	31.0	22.5	15.9	31.5	27.8
Adv Multiplicative P/W	13.7	6.3	4.1	22.7	11.8
Total Part/Whole	*76.1*	*62.7*	*52.0*	*81.9*	*71.5*
Improvement					
Adv Multiplicative P/W	***9.3***	***4.9***	***3.0***	***12.6***	***9.6***
Advanced Additive P/W	***14.4***	***13.7***	***10.6***	***11.7***	***21.0***
Total Part/Whole	***26.7***	***29.0***	***27.3***	***19.6***	***26.9***

Table C25. Percentage of ANP students in 2002 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			**Gender**	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=9333)*	*(n=11084)*	*(n=8049)*	*(n=15279)*	*(n=14488)*
Counting from one	18.2	11.5	8.3	11.6	13.9
Advanced Counting	48.8	43.1	36.9	39.9	46.2
Early Additive P/W	21.5	28.3	29.8	27.2	26.1
Advanced Additive P/W	9.7	14.2	18.3	16.6	11.4
Adv Multiplicative P/W	1.8	3.0	6.6	5.0	2.4
Total Part/Whole	*33.0*	*45.5*	*54.7*	*48.8*	*39.9*
Finally					
Counting from one	5.2	2.7	1.6	3.1	3.4
Advanced Counting	32.8	24.5	17.9	22.6	28.1
Early Additive P/W	33.2	32.5	29.5	30.1	33.8
Advanced Additive P/W	21.2	29.3	33.3	29.6	25.9
Adv Multiplicative P/W	7.7	10.9	17.7	14.6	8.8
Total Part/Whole	*62.1*	*72.7*	*80.5*	*74.3*	*68.5*
Improvement					
Adv Multiplicative P/W	***5.9***	***7.9***	***11.1***	***9.6***	***6.4***
Advanced Additive P/W	***11.5***	***15.1***	***15.0***	***13.0***	***14.5***
Total Part/Whole	***29.1***	***27.2***	***25.8***	***25.5***	***28.6***

Table C26. Percentage of ANP students in 2002 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of School Decile Level & Gender

Stage	School Decile Level Low (1-3)	Med (4-7)	Hi (8-10)
	BOYS		
Boys Initially	*(n=4754)*	*(n=5661)*	*(n=4200)*
Counting from one	17.2	10.1	7.4
Advanced Counting	47.3	39.4	32.4
Early Additive P/W	22.1	29.0	30.1
Advanced Additive P/W	10.9	17.4	21.4
Adv Multiplicative P/W	2.4	4.1	8.8
Total Part/Whole	*35.4*	*50.5*	*60.3*
Boys Finally			
Counting from one	5.2	2.6	1.4
Advanced Counting	30.7	21.4	15.3
Early Additive P/W	32.8	30.5	26.4
Advanced Additive P/W	21.7	32.0	35.1
Adv Multiplicative P/W	9.6	13.5	21.7
Total Part/Whole	*64.1*	*76.0*	*83.2*
	GIRLS		
Girls Initially	*(n=4579)*	*(n=5423)*	*(n=3849)*
Counting from one	19.2	12.9	9.4
Advanced Counting	50.2	46.9	41.8
Early Additive P/W	21.0	27.6	29.4
Advanced Additive P/W	8.4	10.8	15.0
Adv Multiplicative P/W	1.2	1.9	4.3
Total Part/Whole	*30.6*	*40.3*	*48.7*
Girls Finally			
Counting from one	5.2	2.8	1.7
Advanced Counting	35.1	27.8	20.8
Early Additive P/W	33.6	34.7	32.9
Advanced Additive P/W	20.6	26.5	31.2
Adv Multiplicative P/W	5.6	8.2	13.4
Total Part/Whole	*59.8*	*69.4*	*77.5*
Improvement			
Boys			
Advanced Multiplicative P/W	***7.2***	***9.4***	***12.9***
Advanced Additive P/W	***10.8***	***14.6***	***13.7***
Total Part/Whole	***28.7***	***25.5***	***22.9***
Girls			
Advanced Multiplicative P/W	***4.4***	***6.3***	***9.1***
Advanced Additive P/W	***12.2***	***15.7***	***16.2***
Total Part/Whole	***29.2***	***29.1***	***28.8***

Table C27. Percentage of ANP students in 2002 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity and Gender

	Ethnicity			
Stage	NZ Eur	Māori	Pasifika	Asian
	BOYS			
Boys Initially	*(n=9110)*	*(n=3468)*	*(n=1248)*	*(n=815)*
Counting from one	8.8	16.8	22.4	6.3
Advanced Counting	36.0	47.5	51.4	29.6
Early Additive P/W	29.1	23.7	19.6	30.8
Advanced Additive P/W	20.0	10.1	5.4	21.5
Adv Multiplicative P/W	6.1	1.9	1.3	11.9
Total Part/Whole	*55.2*	*35.7*	*26.3*	*64.2*
Boys Finally				
Counting from one	2.1	5.0	6.4	2.2
Advanced Counting	18.0	30.8	41.0	14.8
Early Additive P/W	29.0	33.1	31.7	24.7
Advanced Additive P/W	33.3	23.6	16.5	32.4
Adv Multiplicative P/W	17.6	7.4	4.3	25.9
Total Part/Whole	*79.9*	*64.1*	*52.5*	*83.0*
	GIRLS			
Girls Initially	*(n=8682)*	*(n=3159)*	*(n=1206)*	*(n=783)*
Counting from one	11.4	18.3	23.9	9.3
Advanced Counting	45.3	50.2	53.1	30.3
Early Additive P/W	27.6	23.2	16.9	34.0
Advanced Additive P/W	13.0	7.4	5.1	18.1
Adv Multiplicative P/W	2.6	0.9	1.0	8.3
Total Part/Whole	*43.2*	*31.5*	*23.0*	*60.4*
Girls Finally				
Counting from one	2.4	5.0	6.8	2.9
Advanced Counting	25.3	33.9	41.9	16.1
Early Additive P/W	33.9	34.7	32.3	30.9
Advanced Additive P/W	28.7	21.3	15.3	30.7
Adv Multiplicative P/W	9.7	5.1	3.8	19.4
Total Part/Whole	*72.3*	*61.1*	*51.4*	*81.0*
Improvement				
Boys				
Advanced Multiplicative P/W	***11.5***	***5.5***	***3.0***	***14.0***
Advanced Additive P/W	***13.3***	***13.5***	***11.1***	***10.9***
Total Part/Whole	***24.7***	***28.4***	***26.2***	***18.8***
Girls				
Advanced Multiplicative P/W	***7.1***	***4.2***	***2.8***	***11.1***
Advanced Additive P/W	***15.7***	***13.9***	***10.2***	***12.6***
Total Part/Whole	***29.1***	***29.6***	***28.4***	***20.6***

Table C28. Percentage of ANP students in 2002 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity and School Decile Level

Stage	NZ Eur	Māori	Pasifika	Asian
	LOW DECILE			
Low Decile Initially	*(n=3021)*	*(n=3830)*	*(n=1766)*	*(n=387)*
Counting from one	13.3	20.2	23.6	11.1
Advanced Counting	45.2	50.9	53.2	37.2
Early Additive P/W	24.0	20.9	17.3	29.5
Advanced Additive P/W	14.7	6.9	5.1	17.3
Adv Multiplicative P/W	2.8	1.1	0.8	4.9
Total Part/Whole	*41.5*	*28.9*	*23.2*	*51.7*
Low Decile Finally				
Counting from one	3.0	6.1	7.1	3.4
Advanced Counting	26.2	34.6	43.1	21.4
Early Additive P/W	32.3	34.5	31.5	34.9
Advanced Additive P/W	26.5	19.3	15.0	26.6
Adv Multiplicative P/W	12.0	5.4	3.3	13.7
Total Part/Whole	*70.8*	*59.2*	*49.8*	*75.2*
	MEDIUM DECILE			
Medium Decile Initially	*(n=7808)*	*(n=2089)*	*(n=440)*	*(n=329)*
Counting from one	10.4	13.1	23.4	11.9
Advanced Counting	41.8	47.3	50.9	37.1
Early Additive P/W	29.0	27.0	19.1	29.8
Advanced Additive P/W	15.4	10.9	5.5	17.9
Adv Multiplicative P/W	3.4	1.7	1.1	3.3
Total Part/Whole	*47.8*	*39.6*	*25.7*	*51.0*
Medium Decile Finally				
Counting from one	2.4	3.4	5.9	3.0
Advanced Counting	22.9	29.0	39.3	19.8
Early Additive P/W	32.4	33.6	32.3	26.7
Advanced Additive P/W	30.3	27.0	18.2	34.0
Adv Multiplicative P/W	12.0	7.1	4.3	16.4
Total Part/Whole	*74.7*	*67.7*	*54.8*	*77.1*
	HIGH DECILE			
High Decile Initially	*(n=6233)*	*(n=518)*	*(n=109)*	*(n=696)*
Counting from one	8.4	14.1	9.2	3.9
Advanced Counting	37.6	41.3	48.6	25.9
Early Additive P/W	29.4	28.6	29.4	34.1
Advanced Additive P/W	18.5	13.7	10.1	21.1
Adv Multiplicative P/W	6.1	2.3	2.8	15.1
Total Part/Whole	*54.0*	*44.6*	*42.3*	*70.3*
High Decile Finally				
Counting from one	1.6	2.5	-	1.0
Advanced Counting	17.8	27.6	31.2	11.2
Early Additive P/W	29.8	31.1	33.0	24.1
Advanced Additive P/W	34.0	28.6	23.9	32.6
Adv Multiplicative P/W	16.9	10.2	11.9	31.0
Total Part/Whole	*80.7*	*69.9*	*68.8*	*87.7*

Table C28 (continued). Percentage of ANP students in 2002 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity and School Decile Level

Stage	NZ Eur	Māori	Pasifika	Asian
Improvement				
Low Decile				
Adv Multiplicative P/W	***9.2***	***4.3***	***2.5***	***8.8***
Advanced Additive P/W	***11.8***	***12.4***	***9.9***	***9.3***
Total Part/Whole	***29.3***	***30.3***	***26.6***	***23.5***
Medium Decile				
Adv Multiplicative P/W	***8.6***	***5.4***	***3.2***	***13.1***
Advanced Additive P/W	***14.9***	***16.1***	***12.7***	***16.1***
Total Part/Whole	***26.9***	***28.1***	***29.1***	***26.1***
High Decile				
Adv Multiplicative P/W	***10.8***	***7.9***	***9.1***	***15.9***
Advanced Additive P/W	***15.5***	***14.9***	***13.8***	***11.5***
Total Part/Whole	***26.7***	***25.3***	***26.5***	***17.4***

Table C29. Percentage of ANP students in 2002 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=17719)*	*(n=6557)*	*(n=2429)*	*(n=1583)*	*(n=29587)*
Counting from one	19.4	30.5	34.0	17.4	23.0
Advanced Counting	42.8	46.8	47.4	32.5	43.5
Early Additive P/W	22.7	16.5	13.8	24.1	20.6
Advanced Additive P/W	10.4	5.0	3.8	12.4	8.7
Adv Multiplicative P/W	4.2	1.3	0.9	12.3	3.8
Adv Proportional P/W	0.5	0.1	0.1	1.3	0.4
Total Part/Whole	*37.8*	*22.9*	*18.6*	*50.1*	*33.5*
Finally					
Counting from one	3.2	7.4	9.3	3.8	4.7
Advanced Counting	29.1	40.6	46.4	22.1	32.8
Early Additive P/W	30.4	30.9	29.0	26.1	30.1
Advanced Additive P/W	22.2	15.3	10.7	21.5	19.7
Adv Multiplicative P/W	12.9	5.2	4.2	21.7	11.0
Adv Proportional P/W	2.1	0.5	0.5	4.9	1.8
Total Part/Whole	*67.6*	*51.9*	*44.4*	*74.2*	*62.6*
Improvement					
Adv Proportional P/W	***1.6***	***0.4***	***0.4***	***3.6***	***1.4***
Adv Multiplicative P/W	***8.7***	***3.9***	***3.3***	***9.4***	***7.2***
Advanced Additive P/W	***11.8***	***10.3***	***6.9***	***9.1***	***11.0***
Total Part/Whole	***29.8***	***29.0***	***25.8***	***24.1***	***29.1***

Table C30. Percentage of ANP students in 2002 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=9265)*	*(n=11028)*	*(n=8009)*	*(n=15184)*	*(n=14403)*
Counting from one	28.4	22.9	17.9	23.3	22.6
Advanced Counting	47.7	43.7	39.2	40.2	46.9
Early Additive P/W	16.2	21.0	24.5	21.3	19.9
Advanced Additive P/W	5.7	8.9	11.3	10.1	7.3
Adv Multiplicative P/W	1.9	3.3	6.3	4.6	3.1
Adv Proportional P/W	0.1	0.2	0.9	0.6	0.2
Total Part/Whole	*23.9*	*33.4*	*43.0*	*36.6*	*30.5*
Finally					
Counting from one	6.9	4.0	3.0	4.9	4.5
Advanced Counting	41.0	32.6	24.2	30.8	34.8
Early Additive P/W	29.7	30.8	29.2	28.6	31.5
Advanced Additive P/W	15.0	20.2	24.3	20.7	18.6
Adv Multiplicative P/W	6.6	10.9	15.9	12.6	9.3
Adv Proportional P/W	0.8	1.5	3.3	2.4	1.2
Total Part/Whole	*52.1*	*63.4*	*72.7*	*64.3*	*60.6*
Improvement					
Adv Proportional P/W	***0.7***	***1.3***	***2.4***	***1.8***	***1.0***
Adv Multiplicative P/W	***4.7***	***7.6***	***9.6***	***8.0***	***6.2***
Advanced Additive P/W	***9.3***	***11.3***	***13.0***	***10.6***	***11.3***
Total Part/Whole	***28.2***	***30.0***	***29.7***	***27.7***	***30.1***

Table C31. Percentage of ANP students in 2002 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of School Decile Level & Gender

Stage	School Decile Level Low (1-3)	Med (4-7)	Hi (8-10)
	BOYS		
Boys Initially	*(n=4711)*	*(n=5636)*	*(n=4182)*
Counting from one	29.1	22.8	18.6
Advanced Counting	45.6	40.3	34.8
Early Additive P/W	16.4	22.1	25.1
Advanced Additive P/W	6.6	10.4	13.0
Adv Multiplicative P/W	2.2	4.1	7.2
Adv Proportional P/W	0.2	0.3	1.3
Total Part/Whole	*25.4*	*36.9*	*46.9*
Boys Finally			
Counting from one	7.0	4.2	3.3
Advanced Counting	39.8	30.4	21.9
Early Additive P/W	29.2	29.1	27.2
Advanced Additive P/W	15.2	21.5	25.7
Adv Multiplicative P/W	7.7	12.7	17.6
Adv Proportional P/W	1.0	2.1	4.4
Total Part/Whole	*53.1*	*65.4*	*74.9*
	GIRLS		
Girls Initially	*(n=4554)*	*(n=5392)*	*(n=3827)*
Counting from one	27.7	23.0	17.1
Advanced Counting	49.9	47.2	44.1
Early Additive P/W	16.0	19.8	23.8
Advanced Additive P/W	4.8	7.4	9.4
Adv Multiplicative P/W	1.6	2.5	5.2
Adv Proportional P/W	0.1	0.1	0.4
Total Part/Whole	*22.5*	*29.8*	*38.8*
Girls Finally			
Counting from one	6.7	3.8	2.7
Advanced Counting	42.2	34.8	26.8
Early Additive P/W	30.3	32.6	31.4
Advanced Additive P/W	14.8	18.8	22.9
Adv Multiplicative P/W	5.3	9.1	14.0
Adv Proportional P/W	0.7	0.9	2.2
Total Part/Whole	*51.1*	*61.4*	*70.5*
Improvement			
Boys			
Adv Proportional P/W	***0.8***	***1.8***	***3.1***
Adv Multiplicative P/W	***5.5***	***8.6***	***10.4***
Advanced Additive P/W	***8.6***	***11.1***	***12.7***
Total Part/Whole	***27.7***	***28.5***	***28.0***
Girls			
Adv Proportional P/W	***0.6***	***0.8***	***1.8***
Adv Multiplicative P/W	***3.7***	***6.6***	***8.8***
Advanced Additive P/W	***10.0***	***11.4***	***13.5***
Total Part/Whole	***28.6***	***31.6***	***31.7***

Table C32. Percentage of ANP students in 2002 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity and Gender

Stage	NZ Eur	Māori	Pasifika	Asian
	BOYS			
Boys Initially	*(n=9080)*	*(n=3431)*	*(n=1227)*	*(n=809)*
Counting from one	19.5	31.2	33.4	18.5
Advanced Counting	38.8	45.1	46.9	28.7
Early Additive P/W	23.4	16.8	14.3	24.2
Advanced Additive P/W	12.3	5.2	4.5	13.6
Adv Multiplicative P/W	5.3	1.4	0.7	13.1
Adv Proportional P/W	0.7	0.2	0.2	1.9
Total Part/Whole	*41.7*	*23.6*	*19.7*	*52.8*
Boys Finally				
Counting from one	3.4	7.3	9.0	4.3
Advanced Counting	26.2	40.3	46.7	20.6
Early Additive P/W	28.8	29.6	28.8	24.6
Advanced Additive P/W	23.3	16.5	10.5	22.6
Adv Multiplicative P/W	15.3	5.5	4.5	22.2
Adv Proportional P/W	3.0	0.8	0.5	5.6
Total Part/Whole	*70.4*	*52.4*	*44.3*	*75.0*
	GIRLS			
Girls Initially	*(n=8639)*	*(n=3126)*	*(n=1202)*	*(n=774)*
Counting from one	19.2	29.3	34.6	16.1
Advanced Counting	47.0	48.7	47.8	36.6
Early Additive P/W	21.9	16.1	13.3	24.0
Advanced Additive P/W	8.5	4.7	3.2	11.1
Adv Multiplicative P/W	3.2	1.1	1.1	11.4
Adv Proportional P/W	0.2	0.0	-	0.8
Total Part/Whole	*33.8*	*21.9*	*17.6*	*47.3*
Girls Finally				
Counting from 1 one	2.9	7.6	9.5	3.2
Advanced Counting	32.2	40.9	46.0	23.6
Early Additive P/W	32.0	32.3	29.2	27.6
Advanced Additive P/W	21.1	14.1	10.9	20.3
Adv Multiplicative P/W	10.5	4.8	4.0	21.1
Adv Proportional P/W	1.3	0.3	0.4	4.1
Total Part/Whole	*69.9*	*51.5*	*44.5*	*73.1*
Improvement				
Boys				
Adv Proportional P/W	***2.3***	***0.6***	***0.3***	***3.7***
Adv Multiplicative P/W	***10.0***	***4.1***	***3.8***	***9.1***
Advanced Additive P/W	***11.0***	***11.3***	***6.0***	***9.0***
Total Part/Whole	***28.7***	***28.8***	***24.6***	***22.2***
Girls				
Adv Proportional P/W	***1.1***	***0.3***	***0.4***	***3.3***
Adv Multiplicative P/W	***7.3***	***3.7***	***2.9***	***9.7***
Advanced Additive P/W	***12.6***	***9.4***	***7.7***	***9.2***
Total Part/Whole	***36.1***	***29.6***	***26.9***	***25.8***

Table C33. Percentage of ANP students in 2002 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity and School Decile Level

Stage	NZ Eur	Māori	Pasifika	Asian
	LOW DECILE			
Low Decile Initially	*(n=3000)*	*(n=3789)*	*(n=1757)*	*(n=382)*
Counting from one	21.0	31.8	34.7	24.9
Advanced Counting	47.3	48.6	48.7	38.0
Early Additive P/W	19.8	14.5	12.7	21.2
Advanced Additive P/W	8.8	4.0	3.3	9.9
Adv Multiplicative P/W	2.9	1.1	0.6	5.8
Adv Proportional P/W	0.3	0.1	-	0.3
Total Part/Whole	*31.8*	*19.7*	*16.6*	*37.2*
Low Decile Finally				
Counting from one	4.1	8.3	9.2	5.2
Advanced Counting	34.2	44.6	48.0	29.1
Early Additive P/W	30.2	29.6	29.3	29.3
Advanced Additive P/W	19.7	12.8	10.0	21.5
Adv Multiplicative P/W	10.3	4.3	3.4	13.1
Adv Proportional P/W	1.5	0.4	0.2	1.8
Total Part/Whole	*61.7*	*47.1*	*42.9*	*65.7*
	MEDIUM DECILE			
Medium Decile Initially	*(n=7789)*	*(n=2070)*	*(n=432)*	*(n=323)*
Counting from one	20.7	28.7	36.3	22.9
Advanced Counting	43.5	44.7	44.9	38.7
Early Additive P/W	21.9	19.3	13.2	20.4
Advanced Additive P/W	10.0	6.1	4.2	8.0
Adv Multiplicative P/W	3.6	1.2	1.4	9.6
Adv Proportional P/W	0.3	-	-	0.3
Total Part/Whole	*35.8*	*26.6*	*18.8*	*38.3*
Medium Decile Finally				
Counting from one	3.1	5.9	10.4	6.2
Advanced Counting	31.1	36.1	47.0	27.9
Early Additive P/W	30.8	32.9	24.3	27.2
Advanced Additive P/W	21.2	18.5	11.6	17.3
Adv Multiplicative P/W	12.0	6.0	6.0	18.6
Adv Proportional P/W	1.8	0.4	0.7	2.8
Total Part/Whole	*65.8*	*57.8*	*42.6*	*65.9*
	HIGH DECILE			
High Decile Initially	*(n=6203)*	*(n=513)*	*(n=109)*	*(n=692)*
Counting from one	17.9	25.1	22.0	12.3
Advanced Counting	40.3	43.7	41.3	28.8
Early Additive P/W	24.6	20.1	24.8	25.3
Advanced Additive P/W	11.2	7.2	9.2	15.2
Adv Multiplicative P/W	5.3	3.1	2.8	16.0
Adv Proportional P/W	0.7	0.8	-	2.5
Total Part/Whole	*41.8*	*31.2*	*36.8*	*59.0*
High Decile Finally				
Counting from one	2.9	5.5	4.6	2.2
Advanced Counting	24.6	29.4	30.3	16.2
Early Additive P/W	29.6	33.3	33.9	23.3
Advanced Additive P/W	24.9	21.4	17.4	22.7
Adv Multiplicative P/W	15.2	8.4	11.0	28.0
Adv Proportional P/W	2.9	1.9	2.8	7.7
Total Part/Whole	*72.6*	*65.0*	*65.1*	*81.7*

Table C33 (continued). Percentage of ANP students in 2002 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity and School Decile Level

Stage	NZ Eur	Māori	Pasifika	Asian
Improvement				
Low Decile				
Adv Proportional P/W	***1.2***	***0.3***	***0.2***	***1.5***
Adv Multiplicative P/W	***7.4***	***3.2***	***2.8***	***7.3***
Advanced Additive P/W	***10.9***	***8.8***	***6.7***	***11.6***
Total Part/Whole	***29.9***	***27.4***	***26.3***	***28.5***
Medium Decile				
Adv Proportional P/W	***1.5***	***0.4***	***0.7***	***2.5***
Adv Multiplicative P/W	***8.4***	***4.8***	***4.6***	***9.0***
Advanced Additive P/W	***11.2***	***12.4***	***7.4***	***9.3***
Total Part/Whole	***30.0***	***31.2***	***23.8***	***27.6***
High Decile				
Adv Proportional P/W	***2.2***	***1.1***	***2.8***	***5.2***
Adv Multiplicative P/W	***9.9***	***5.3***	***8.2***	***12.0***
Advanced Additive P/W	***13.7***	***14.2***	***8.2***	***7.5***
Total Part/Whole	***30.8***	***33.8***	***28.3***	***22.7***

Table C34. Percentage of ANP students in 2003 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=33878)*	*(n=13466)*	*(n=4903)*	*(n=2634)*	*(n=57316)*
Counting from one	6.3	13.1	16.8	5.0	8.9
Advanced Counting	38.4	49.5	54.4	29.2	42.1
Early Additive P/W	43.0	32.3	24.8	43.2	38.7
Advanced Additive P/W	12.3	5.1	4.0	22.7	10.3
Total Part/Whole	*55.3*	*37.4*	*28.8*	*65.9*	*49.0*
Finally					
Counting from one	2.7	6.2	8.5	2.5	4.1
Advanced Counting	18.5	29.6	38.5	14.1	22.8
Early Additive P/W	51.1	48.9	42.5	44.2	49.4
Advanced Additive P/W	27.7	15.3	10.5	39.3	23.7
Total Part/Whole	*78.8*	*64.2*	*53.0*	*83.5*	*73.1*
Improvement					
Advanced Additive P/W	***15.4***	***10.2***	***6.5***	***16.6***	***13.4***
Total Part/Whole	***23.5***	***26.8***	***24.2***	***17.6***	***24.1***

Table C35. Percentage of ANP students in 2003 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=18969)*	*(n=21103)*	*(n=15527)*	*(n=29280)*	*(n=28036)*
Counting from one	13.7	7.7	4.6	9.3	8.5
Advanced Counting	49.6	42.2	33.2	37.6	46.7
Early Additive P/W	30.7	40.3	46.8	39.7	37.7
Advanced Additive P/W	6.0	9.9	15.4	13.4	7.2
Total Part/Whole	*36.7*	*50.2*	*62.2*	*53.1*	*44.9*
Finally					
Counting from one	6.7	3.5	1.5	4.2	3.9
Advanced Counting	31.0	21.4	14.7	20.3	25.5
Early Additive P/W	46.6	51.1	51.0	47.5	51.4
Advanced Additive P/W	15.8	23.9	32.8	28.0	19.2
Total Part/Whole	*62.4*	*75.0*	*83.8*	*75.5*	*70.6*
Improvement					
Advanced Additive P/W	***9.8***	***14.0***	***17.4***	***14.6***	***12.0***
Total Part/Whole	***25.7***	***24.8***	***21.6***	***22.4***	***25.7***

Table C36. Percentage of ANP students in 2003 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity

Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=30661)*	*(n=11170)*	*(n=3834)*	*(n=2465)*	*(n=50241)*
Counting from one	10.7	17.8	23.5	7.8	13.2
Advanced Counting	39.7	48.7	51.1	28.8	42.0
Early Additive P/W	27.9	23.3	18.0	30.5	26.2
Advanced Additive P/W	17.9	9.0	6.5	23.8	15.3
Adv Multiplicative P/W	3.9	1.2	0.9	9.1	3.3
Total Part/Whole	*49.7*	*33.5*	*25.4*	*63.4*	*44.8*
Finally					
Counting from one	2.2	5.0	5.7	2.2	3.1
Advanced Counting	21.3	32.6	41.3	13.8	25.0
Early Additive P/W	30.5	32.9	31.1	25.2	30.8
Advanced Additive P/W	32.7	23.7	17.8	36.5	29.7
Adv Multiplicative P/W	13.3	5.9	4.1	22.2	11.4
Total Part/Whole	*76.5*	*62.5*	*53.0*	*83.9*	*71.9*
Improvement					
Adv Multiplicative P/W	***9.4***	***4.7***	***3.2***	***13.1***	***8.1***
Advanced Additive P/W	***14.8***	***14.7***	***11.3***	***12.7***	***14.4***
Total Part/Whole	***26.8***	***29.0***	***27.6***	***20.5***	***27.1***

Table C37. Percentage of ANP students in 2003 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			**Gender**	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=15625)*	*(n=18667)*	*(n=14467)*	*(n=25494)*	*(n=24747)*
Counting from one	18.4	12.5	8.6	12.0	14.4
Advanced Counting	48.4	42.5	35.5	39.3	44.9
Early Additive P/W	21.7	27.0	29.6	26.5	25.9
Advanced Additive P/W	9.9	15.2	20.6	17.7	12.7
Adv Multiplicative P/W	1.6	2.8	5.6	4.5	2.1
Total Part/Whole	*33.2*	*45.0*	*55.8*	*48.7*	*40.7*
Finally					
Counting from one	4.9	2.7	1.7	2.9	3.3
Advanced Counting	33.4	24.4	17.2	22.5	27.7
Early Additive P/W	32.0	31.6	28.4	29.0	32.6
Advanced Additive P/W	22.7	30.8	35.7	31.3	28.0
Adv Multiplicative P/W	7.1	10.5	17.0	14.3	8.4
Total Part/Whole	*61.8*	*72.9*	*81.1*	*74.6*	*69.0*
Improvement					
Adv Multiplicative P/W	***5.5***	***7.7***	***11.4***	***9.8***	***6.3***
Adv Additive P/W	***12.8***	***15.6***	***15.1***	***13.6***	***15.3***
Total Part/Whole	***28.6***	***27.9***	***25.3***	***25.9***	***28.3***

Table C38. Percentage of ANP students in 2003 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=30562)*	*(n=10922)*	*(n=3718)*	*(n=2439)*	*(n=49731)*
Counting from one	16.2	26.3	30.4	15.2	19.5
Advanced Counting	45.9	51.2	50.7	33.9	46.8
Early Additive P/W	23.1	16.9	14.5	25.2	21.1
Advanced Additive P/W	10.7	4.5	3.6	14.7	9.0
Adv Multiplicative P/W	3.7	1.0	0.7	10.0	3.3
Adv Proportional P/W	0.4	0.1	0.1	1.0	0.3
Total Part/Whole	*37.9*	*22.5*	*18.9*	*50.9*	*33.7*
Finally					
Counting from one	2.5	6.0	7.0	2.9	3.7
Advanced Counting	29.5	42.9	47.1	21.5	33.5
Early Additive P/W	31.0	31.0	29.9	26.4	30.6
Advanced Additive P/W	22.9	15.2	11.6	25.2	20.5
Adv Multiplicative P/W	12.1	4.5	4.1	19.7	10.2
Adv Proportional P/W	1.9	0.4	0.3	4.3	1.6
Total Part/Whole	*67.9*	*51.1*	*45.9*	*75.6*	*62.9*
Improvement					
Adv Proportional P/W	***1.5***	***0.3***	***0.2***	***3.3***	***1.3***
Adv Multiplicative P/W	***8.4***	***3.5***	***3.4***	***9.7***	***6.9***
Adv Additive P/W	***12.2***	***10.7***	***8.0***	***10.5***	***11.5***
Total Part/Whole	***30.0***	***28.6***	***27.0***	***24.7***	***29.2***

Table C39. Percentage of ANP students in 2003 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=15243)*	*(n=18651)*	*(n=14403)*	*(n=25256)*	*(n=24475)*
Counting from one	25.5	18.7	14.5	20.0	19.0
Advanced Counting	50.8	47.8	42.4	43.4	50.4
Early Additive P/W	16.7	21.8	24.5	21.9	20.3
Advanced Additive P/W	5.3	8.6	12.8	10.2	7.6
Adv Multiplicative P/W	1.5	2.9	5.2	4.0	2.5
Adv Proportional P/W	0.1	0.2	0.6	0.5	0.1
Total Part/Whole	*23.6*	*33.5*	*43.1*	*36.6*	*30.5*
Finally					
Counting from one	5.8	2.9	2.3	3.8	3.5
Advanced Counting	42.6	33.4	24.6	31.3	35.7
Early Additive P/W	30.2	31.7	29.6	29.5	31.8
Advanced Additive P/W	15.1	20.9	25.6	21.4	19.5
Adv Multiplicative P/W	5.8	9.6	15.3	11.8	8.5
Adv Proportional P/W	0.6	1.4	2.7	2.2	1.0
Total Part/Whole	*51.7*	*63.6*	*73.2*	*64.9*	*60.8*
Improvement					
Adv Proportional P/W	***0.5***	***1.2***	***2.1***	***1.7***	***0.9***
Adv Multiplicative P/W	***4.3***	***6.7***	***10.1***	***7.8***	***6.0***
Adv Additive P/W	***9.8***	***12.3***	***12.8***	***11.2***	***11.9***
Total Part/Whole	***28.1***	***30.1***	***30.1***	***28.3***	***30.3***

Table C40. Percentage of INP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=1130)*	*(n=379)*	*(n=75)*	*(n=206)*	*(n=1878)*
Counting from one	5.1	7.4	12.0	4.9	5.7
Advanced Counting	18.7	36.4	32.0	7.3	21.6
Early Additive P/W	48.1	41.2	40.0	40.3	45.3
Advanced Additive P/W	28.1	15.0	16.0	47.6	27.5
Total Part/Whole	*76.2*	*56.2*	*56.0*	*87.9*	*72.8*
Finally					
Counting from one	2.7	2.6	9.3	1.9	2.8
Advanced Counting	6.6	17.4	14.7	4.9	9.1
Early Additive P/W	41.2	48.5	44.0	25.7	40.5
Advanced Additive P/W	49.6	31.4	32.0	67.5	47.6
Total Part/Whole	*90.8*	*79.9*	*76.0*	*93.2*	*88.1*
Improvement					
Advanced Additive P/W	***21.5***	***16.4***	***16.0***	***19.9***	***20.1***
Total Part/Whole	***14.6***	***23.7***	***20.0***	***5.3***	***15.3***

Table C41. Percentage of INP students in 2001 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=705)*	*(n=615)*	*(n=558)*	*(n=986)*	*(n=892)*
Counting from one	10.6	1.6	3.9	5.0	6.5
Advanced Counting	23.8	29.3	10.2	20.4	22.9
Early Additive P/W	47.2	45.7	42.3	43.8	46.9
Advanced Additive P/W	18.3	23.4	43.5	30.8	23.8
Total Part/Whole	*65.5*	*69.1*	*85.8*	*74.6*	*70.7*
Finally					
Counting from one	5.7	0.7	1.6	2.6	3.0
Advanced Counting	11.3	10.6	4.7	8.2	10.1
Early Additive P/W	48.7	41.5	29.2	38.9	42.3
Advanced Additive P/W	34.3	47.3	64.5	50.2	44.6
Total Part/Whole	*83.0*	*88.8*	*93.7*	*89.1*	*86.9*
Improvement					
Advanced Additive P/W	***16.0***	***23.9***	***21.0***	***19.4***	***20.8***
Total Part/Whole	***17.5***	***19.7***	***7.9***	***14.5***	***16.2***

Table C42. Percentage of INP students in 2001 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=1130)*	*(n=379)*	*(n=75)*	*(n=206)*	*(n=1878)*
Counting from one	4.9	8.4	12.0	3.4	5.6
Advanced Counting	12.9	31.4	24.0	5.3	16.4
Early Additive P/W	32.0	30.9	29.3	20.9	30.0
Advanced Additive P/W	34.1	20.6	28.0	38.8	31.7
Adv Multiplicative P/W	16.1	8.7	6.7	31.6	16.2
Total Part/Whole	*82.2*	*60.2*	*64.0*	*91.3*	*77.9*
Finally					
Counting from one	2.5	3.7	8.0	1.9	2.9
Advanced Counting	6.0	18.5	16.0	2.9	8.7
Early Additive P/W	21.8	28.8	26.7	8.7	21.9
Advanced Additive P/W	37.7	31.1	36.0	36.4	35.9
Adv Multiplicative P/W	32.0	17.9	13.3	50.0	30.5
Total Part/Whole	*91.5*	*77.8*	*76.0*	*95.1*	*88.3*
Improvement					
Adv Multiplicative P/W	***15.9***	***9.2***	***6.6***	***18.4***	***14.3***
Advanced Additive P/W	***3.6***	***10.5***	***8.0***	***-2.4***	***4.2***
Total Part/Whole	***9.3***	***17.6***	***12.0***	***3.8***	***10.4***

Table C43. Percentage of INP students in 2001 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=705)*	*(n=615)*	*(n=558)*	*(n=986)*	*(n=892)*
Counting from one	12.6	1.0	2.0	6.2	5.0
Advanced Counting	23.1	18.9	5.2	15.8	17.0
Early Additive P/W	29.6	33.7	26.5	27.2	33.2
Advanced Additive P/W	26.8	31.7	38.0	30.8	32.7
Adv Multiplicative P/W	7.8	14.8	28.3	20.0	12.0
Total Part/Whole	*64.2*	*80.2*	*92.8*	*78.0*	*77.9*
Finally					
Counting from one	6.7	0.5	0.9	3.0	2.8
Advanced Counting	16.0	5.9	2.5	9.0	8.3
Early Additive P/W	26.4	23.3	14.9	19.7	24.4
Advanced Additive P/W	34.0	39.5	34.4	34.6	37.4
Adv Multiplicative P/W	16.9	30.9	47.3	33.7	27.0
Total Part/Whole	*77.3*	*93.7*	*96.6*	*88.0*	*88.8*
Improvement					
Adv Multiplicative P/W	***9.1***	***16.1***	***19.0***	***13.7***	***15.0***
Adv Additive P/W	***7.2***	***7.8***	***-3.6***	***3.8***	***4.7***
Total Part/Whole	***13.1***	***13.5***	***3.8***	***10.0***	***10.9***

Table C44. Percentage of INP students in 2001 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=1130)*	*(n=379)*	*(n=75)*	*(n=206)*	*(n=1878)*
Counting from one	23.7	36.7	44.0	15.5	26.3
Advanced Counting	24.7	34.3	28.0	6.3	24.7
Early Additive P/W	13.7	13.5	10.7	7.8	12.7
Advanced Additive P/W	19.9	9.2	9.3	24.3	17.5
Adv Multiplicative P/W	15.0	5.5	8.0	28.6	14.7
Adv Proportional P/W	3.0	0.8	-	17.5	4.1
Total Part/Whole	*51.6*	*29.0*	*28.0*	*78.2*	*49.0*
Finally					
Counting from one	12.5	22.2	30.7	5.3	14.3
Advanced Counting	15.2	28.8	24.0	7.3	17.4
Early Additive P/W	15.6	17.9	20.0	4.4	14.9
Advanced Additive P/W	25.4	18.2	14.7	25.2	23.5
Adv Multiplicative P/W	23.2	9.2	8.0	31.6	20.6
Adv Proportional P/W	8.1	3.7	2.7	26.2	9.4
Total Part/Whole	*72.3*	*49.0*	*45.4*	*87.4*	*68.4*
Improvement					
Adv Proportional P/W	***5.1***	***2.9***	***2.7***	***8.7***	***5.3***
Adv Multiplicative P/W	***8.2***	***3.7***	***0.0***	***3.0***	***5.9***
Adv Additive P/W	***5.5***	***9.0***	***5.4***	***0.9***	***6.0***
Total Part/Whole	***20.7***	***20.0***	***17.4***	***9.2***	***19.4***

Table C45. Percentage of INP students in 2001 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=705)*	*(n=615)*	*(n=558)*	*(n=986)*	*(n=892)*
Counting from one	52.9	6.3	14.7	26.0	26.7
Advanced Counting	16.2	44.1	14.2	23.4	26.1
Early Additive P/W	10.8	18.4	8.8	12.4	13.0
Advanced Additive P/W	11.1	18.5	24.6	14.8	20.5
Adv Multiplicative P/W	7.8	10.9	27.6	18.0	11.1
Adv Proportional P/W	1.3	1.8	10.2	5.5	2.6
Total Part/Whole	*31.0*	*49.6*	*71.2*	*50.7*	*47.2*
Finally					
Counting from one	32.5	1.6	5.2	14.8	13.7
Advanced Counting	19.3	23.6	8.1	17.3	17.4
Early Additive P/W	13.6	20.7	10.2	15.1	14.7
Advanced Additive P/W	20.0	26.8	24.4	19.2	28.4
Adv Multiplicative P/W	10.4	21.8	32.1	21.1	20.0
Adv Proportional P/W	4.3	5.5	20.1	12.5	5.9
Total Part/Whole	*48.3*	*74.8*	*86.8*	*67.9*	*69.0*
Improvement					
Adv Proportional P/W	***3.0***	***3.7***	***9.9***	***7.0***	***3.3***
Adv Multiplicative P/W	***2.6***	***10.9***	***4.5***	***3.1***	***8.9***
Adv Additive P/W	***8.9***	***8.3***	***-0.2***	***4.4***	***7.9***
Total Part/Whole	***17.3***	***25.2***	***15.6***	***17.2***	***21.8***

Table C46. Percentage of INP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=3601)*	*(n=1690)*	*(n=566)*	*(n=312)*	*(n=6418)*
Counting from one	2.5	4.1	6.5	1.9	3.3
Advanced Counting	25.1	39.5	44.7	16.7	30.3
Early Additive P/W	43.5	42.2	37.3	37.2	42.1
Advanced Additive P/W	28.9	14.1	11.5	44.2	24.3
Total Additive P/W	*72.4*	*56.3*	*48.8*	*81.4*	*66.4*
Finally					
Counting from one	1.9	2.8	3.5	0.6	2.2
Advanced Counting	9.9	20.0	25.4	6.4	13.8
Early Additive P/W	40.3	50.4	50.0	29.5	43.5
Advanced Additive P/W	47.9	26.8	21.0	63.5	40.4
Total Additive P/W	*88.2*	*77.2*	*71.0*	*93.0*	*83.9*
Improvement					
Advanced Part/Whole	***19.0***	***12.7***	***9.5***	***19.3***	***16.1***
Total Part/Whole	***15.8***	***20.9***	***22.2***	***11.6***	***17.5***

Table C47. Percentage of INP students in 2002 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=2026)*	*(n=2942)*	*(n=1273)*	*(n=3330)*	*(n=3088)*
Counting from one	4.4	3.5	1.1	3.9	2.7
Advanced Counting	38.3	30.3	19.4	26.9	33.9
Early Additive P/W	42.4	42.4	40.1	41.1	43.2
Advanced Additive P/W	14.9	23.8	39.4	28.1	20.1
Total Part/Whole	*57.3*	*66.2*	*79.5*	*69.2*	*63.3*
Finally					
Counting from one	2.4	2.4	1.6	2.5	2.0
Advanced Counting	20.1	13.0	6.5	12.5	15.3
Early Additive P/W	50.0	44.3	32.2	40.7	46.6
Advanced Additive P/W	27.5	40.3	59.6	44.4	36.1
Total Part/Whole	*77.5*	*84.6*	*91.8*	*85.1*	*82.7*
Improvement					
Advanced Part/Whole	***12.6***	***16.5***	***20.2***	***16.3***	***16.0***
Total Part/Whole	***20.2***	***18.4***	***12.3***	***15.9***	***19.4***

Table C48. Percentage of INP students in 2002 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity

Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=3464)*	*(n=1589)*	*(n=522)*	*(n=303)*	*(n=6113)*
Counting from one	4.6	8.6	10.0	1.7	5.9
Advanced Counting	23.8	35.5	43.1	11.6	28.0
Early Additive P/W	30.1	32.3	30.5	33.3	30.8
Advanced Additive P/W	28.7	18.8	12.3	33.0	24.8
Adv Multiplicative P/W	12.9	4.8	4.2	20.5	10.5
Total Part/Whole	*71.7*	*55.9*	*47.0*	*86.8*	*66.1*
Finally					
Counting from one	1.2	2.9	3.3	-	1.7
Advanced Counting	10.7	20.3	26.1	4.6	14.3
Early Additive P/W	22.8	32.7	33.5	18.5	26.0
Advanced Additive P/W	35.2	30.5	26.6	29.4	33.0
Adv Multiplicative P/W	30.1	13.7	10.5	47.5	25.0
Total Part/Whole	*88.1*	*76.9*	*70.6*	*95.4*	*84.0*
Improvement					
Adv Multiplicative P/W	***17.2***	***8.9***	***6.3***	***27.0***	***14.5***
Adv Additive P/W	***6.5***	***11.7***	***14.3***	***-3.6***	***8.2***
Total Part/Whole	***16.4***	***21.0***	***23.6***	***8.6***	***17.9***

Table C49. Percentage of INP students in 2002 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			**Gender**	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=1901)*	*(n=2803)*	*(n=1240)*	*(n=3159)*	*(n=2954)*
Counting from one	8.4	5.8	2.6	6.0	5.8
Advanced Counting	35.4	29.1	15.9	25.5	30.8
Early Additive P/W	32.3	29.4	30.2	29.5	32.1
Advanced Additive P/W	19.0	24.9	33.1	26.1	23.3
Adv Multiplicative P/W	4.8	10.8	18.1	12.9	8.0
Total Part/Whole	*56.1*	*65.1*	*81.4*	*68.5*	*63.4*
Finally					
Counting from one	3.2	1.4	0.4	1.6	1.9
Advanced Counting	19.7	14.5	6.5	13.4	15.3
Early Additive P/W	32.7	24.7	18.2	23.1	29.1
Advanced Additive P/W	29.8	34.2	35.2	33.5	32.5
Adv Multiplicative P/W	14.6	25.2	39.8	28.5	21.2
Total Part/Whole	*77.1*	*84.1*	*93.2*	*85.1*	*82.8*
Improvement					
Adv Multiplicative P/W	***9.8***	***14.4***	***21.7***	***15.6***	***13.2***
Adv Additive P/W	***10.8***	***9.3***	***21.0***	***7.4***	***9.2***
Total Part/Whole	***21.0***	***19.0***	***11.8***	***16.6***	***19.4***

Table C50. Percentage of INP students in 2002 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=3431)*	*(n=1581)*	*(n=520)*	*(n=299)*	*(n=6065)*
Counting from one	8.4	17.9	19.2	8.0	11.9
Advanced Counting	28.8	39.1	41.9	13.0	31.8
Early Additive P/W	26.0	25.9	24.2	25.1	25.8
Advanced Additive P/W	20.4	12.2	11.0	23.7	17.4
Adv Multiplicative P/W	13.4	4.4	3.5	22.7	10.7
Adv Proportional P/W	3.0	0.4	0.2	7.4	2.4
Total Additive Part/Whole	*62.8*	*42.9*	*38.9*	*78.9*	*56.3*
Finally					
Counting from one	2.5	4.4	4.0	1.7	3.1
Advanced Counting	14.7	27.1	32.7	5.7	19.1
Early Additive P/W	22.5	29.9	31.2	14.4	24.9
Advanced Additive P/W	27.6	24.2	19.6	26.8	25.9
Adv Multiplicative P/W	24.3	12.2	10.8	29.4	20.0
Adv Proportional P/W	8.3	2.3	1.7	22.1	7.0
Total Additive Part/Whole	*82.7*	*68.6*	*63.3*	*92.7*	*77.8*
Improvement					
Adv Proportional P/W	***5.3***	***1.9***	***1.5***	***14.7***	***4.6***
Adv Multiplicative P/W	***10.9***	***7.8***	***7.3***	***6.7***	***9.3***
Advanced Additive P/W	***7.2***	***12.0***	***8.6***	***3.1***	***8.5***
Total Part/Whole	***19.9***	***25.7***	***24.4***	***13.8***	***21.5***

Table C51. Percentage of INP students in 2002 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=1888)*	*(n=2767)*	*(n=1241)*	*(n=3135)*	*(n=2930)*
Counting from one	16.5	12.1	5.3	12.4	11.3
Advanced Counting	37.6	32.9	20.8	29.0	34.8
Early Additive P/W	25.5	25.6	26.7	25.4	26.2
Advanced Additive P/W	14.0	17.7	21.7	17.6	17.2
Adv Multiplicative P/W	5.6	10.0	19.3	12.0	9.2
Adv Proportional P/W	0.8	1.8	6.3	3.5	1.3
Total Part/Whole	*45.9*	*55.1*	*74.0*	*58.5*	*53.9*
Finally					
Counting from one	4.1	3.2	1.5	3.4	2.8
Advanced Counting	25.9	19.3	10.1	17.6	20.8
Early Additive P/W	29.0	25.3	17.4	23.7	26.3
Advanced Additive P/W	24.2	27.1	25.8	25.5	26.3
Adv Multiplicative P/W	14.0	19.6	29.8	21.3	18.6
Adv Proportional P/W	2.8	5.6	15.5	8.6	5.3
Total Part/Whole	*70.0*	*77.6*	*88.5*	*79.1*	*76.5*
Improvement					
Adv Proportional P/W	***2.0***	***3.8***	***9.2***	***5.1***	***4.0***
Adv Multiplicative P/W	***8.4***	***9.6***	***10.5***	***9.3***	***9.4***
Advanced Additive P/W	***10.2***	***9.4***	***4.1***	***7.9***	***9.1***
Total Part/Whole	***24.1***	***22.5***	***14.5***	***20.6***	***22.6***

Table C52. Percentage of INP students in 2003 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=7173)*	*(n=3786)*	*(n=1405)*	*(n=599)*	*(n=13460)*
Counting from one	2.8	3.9	6.8	3.8	3.6
Advanced Counting	26.1	40.3	44.6	17.2	31.7
Early Additive P/W	45.4	42.1	38.4	40.7	43.5
Advanced Additive P/W	25.7	13.7	10.2	38.2	21.2
Total Part/Whole	*71.1*	*55.8*	*48.6*	*78.9*	*64.7*
Finally					
Counting from one	1.7	3.1	12.1	3.0	3.5
Advanced Counting	11.0	20.4	22.6	5.2	14.6
Early Additive P/W	41.1	48.8	43.2	31.1	43.1
Advanced Additive P/W	46.2	27.8	22.1	60.8	38.9
Total Part/Whole	*87.3*	*76.6*	*65.3*	*91.9*	*82.0*
Improvement					
Advanced Additive P/W	***20.5***	***14.1***	***11.9***	***22.6***	***17.7***
Total Part/Whole	***16.2***	***20.8***	***16.7***	***13.0***	***17.3***

Table C53. Percentage of INP students in 2003 at each framework stage on Addition/Subtraction at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=5373)*	*(n=5640)*	*(n=1984)*	*(n=6937)*	*(n=6523)*
Counting from one	4.2	3.2	2.5	4.0	3.2
Advanced Counting	37.6	30.0	21.6	28.7	34.9
Early Additive P/W	43.0	44.2	41.8	42.7	44.3
Advanced Additive P/W	15.2	22.6	34.1	24.6	17.7
Total Part/Whole	*58.2*	*66.8*	*75.9*	*67.3*	*62.0*
Finally					
Counting from one	6.0	2.0	1.4	3.5	3.4
Advanced Counting	18.4	13.4	7.9	13.4	15.9
Early Additive P/W	45.9	42.9	35.4	40.9	45.3
Advanced Additive P/W	29.7	41.7	55.3	42.2	35.3
Total Part/Whole	*75.6*	*84.6*	*90.7*	*83.1*	*80.6*
Improvement					
Advanced Additive P/W	***14.5***	***19.1***	***21.2***	***17.6***	***17.6***
Total Part/Whole	***17.4***	***17.8***	***14.8***	***15.8***	***18.6***

Table C54. Percentage of INP students in 2003 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=6899)*	*(n=3560)*	*(n=1180)*	*(n=562)*	*(n=12646)*
Counting from one	4.5	9.0	10.3	3.0	6.2
Advanced Counting	23.7	35.6	41.1	14.4	28.4
Early Additive P/W	30.5	30.7	29.4	31.0	30.5
Advanced Additive P/W	30.8	20.5	15.6	34.7	26.5
Adv Multiplicative P/W	10.5	4.2	3.6	16.9	8.4
Total Part/Whole	*71.8*	*55.4*	*48.6*	*82.6*	*65.4*
Finally					
Counting from one	1.1	2.4	3.0	0.4	1.6
Advanced Counting	10.4	20.1	24.7	6.0	14.4
Early Additive P/W	22.1	31.1	31.5	16.0	25.2
Advanced Additive P/W	38.8	33.9	30.1	35.1	36.4
Adv Multiplicative P/W	27.6	12.5	10.8	42.5	22.4
Total Part/Whole	*88.5*	*77.5*	*72.4*	*93.6*	*84.0*
Improvement					
Adv Multiplicative P/W	***17.1***	***8.3***	***7.2***	***25.6***	***14.0***
Advanced Additive P/W	***8.0***	***13.4***	***14.5***	***0.4***	***9.9***
Total Part/Whole	***16.7***	***22.1***	***23.8***	***11.0***	***18.6***

Table C55. Percentage of INP students in 2003 at each framework stage on Multiplication/Division at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=4892)*	*(n=5406)*	*(n=1920)*	*(n=6500)*	*(n=6146)*
Counting from one	8.2	5.3	3.3	6.3	6.2
Advanced Counting	34.2	27.2	18.2	26.4	30.5
Early Additive P/W	30.5	30.4	29.4	28.9	32.2
Advanced Additive P/W	22.3	27.9	33.2	27.9	24.9
Adv Multiplicative P/W	4.8	9.2	15.9	10.5	6.2
Total Part/Whole	*57.6*	*67.5*	*78.5*	*67.3*	*63.3*
Finally					
Counting from one	2.3	1.3	0.8	1.5	1.7
Advanced Counting	19.1	12.8	7.6	13.3	15.6
Early Additive P/W	29.1	23.9	18.4	23.3	27.2
Advanced Additive P/W	34.4	37.6	37.0	36.1	36.7
Adv Multiplicative P/W	15.1	24.4	36.3	25.8	18.8
Total Part/Whole	*78.6*	*85.9*	*91.7*	*85.2*	*82.7*
Improvement					
Adv Multiplicative P/W	***10.3***	***15.2***	***20.4***	***15.3***	***12.6***
Advanced Additive P/W	***12.1***	***9.7***	***3.8***	***8.2***	***11.8***
Total Part/Whole	***21.0***	***18.4***	***13.2***	***17.9***	***19.4***

Table C56. Percentage of INP students in 2003 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Ethnicity

	Ethnicity				
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
Initially	*(n=6865)*	*(n=3520)*	*(n=1171)*	*(n=554)*	*(n=12552)*
Counting from one	7.1	13.0	14.2	6.9	9.5
Advanced Counting	30.1	43.4	49.5	17.1	35.1
Early Additive P/W	28.5	26.7	22.3	24.7	27.2
Advanced Additive P/W	21.5	12.5	10.8	27.3	18.2
Adv Multiplicative P/W	10.7	4.1	3.0	19.1	8.4
Adv Proportional P/W	2.2	0.3	0.2	4.9	1.6
Total Part/Whole	*62.9*	*43.6*	*36.3*	*76.0*	*55.4*
Finally					
Counting from one	1.9	2.9	2.6	1.1	2.2
Advanced Counting	15.5	29.1	35.4	7.8	20.9
Early Additive P/W	25.0	31.6	31.3	15.9	27.1
Advanced Additive P/W	29.1	23.8	20.7	30.9	26.9
Adv Multiplicative P/W	22.1	10.9	8.9	27.3	17.7
Adv Proportional P/W	6.5	1.7	1.2	17.1	5.2
Total Part/Whole	*82.7*	*68.0*	*62.1*	*91.2*	*76.9*
Improvement					
Adv Proportional P/W	***4.3***	***1.4***	***1.0***	***12.2***	***3.6***
Adv Multiplicative P/W	***11.4***	***6.8***	***5.9***	***8.2***	***9.3***
Advanced Additive P/W	***7.6***	***11.3***	***9.9***	***3.6***	***8.7***
Total Part/Whole	***19.8***	***24.4***	***25.8***	***15.2***	***21.5***

Table C57. Percentage of INP students in 2003 at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of School Decile Level and of Gender

	School Decile Level			Gender	
Stage	Low (1-3)	Med (4-7)	Hi (8-10)	Boys	Girls
Initially	*(n=4838)*	*(n=5370)*	*(n=1917)*	*(n=6455)*	*(n=6097)*
Counting from one	11.9	8.8	5.8	9.6	9.4
Advanced Counting	41.9	32.8	23.1	33.4	36.8
Early Additive P/W	25.1	28.8	27.9	26.1	28.4
Advanced Additive P/W	15.2	19.8	21.6	18.9	17.4
Adv Multiplicative P/W	5.1	8.6	16.7	9.7	7.1
Adv Proportional P/W	0.8	1.3	4.9	2.3	0.9
Total Part/Whole	*46.2*	*58.5*	*71.1*	*57.0*	*53.8*
Finally					
Counting from one	2.7	2.1	1.7	2.2	2.2
Advanced Counting	27.4	18.6	11.4	20.4	21.5
Early Additive P/W	29.5	27.2	19.8	25.6	28.7
Advanced Additive P/W	25.5	28.0	26.9	26.1	27.7
Adv Multiplicative P/W	12.2	19.6	26.8	19.3	16.0
Adv Proportional P/W	2.7	4.5	13.4	6.4	3.9
Total Part/Whole	*69.9*	*79.3*	*86.9*	*77.4*	*76.3*
Improvement					
Adv Proportional P/W	***1.9***	***3.2***	***8.5***	***4.1***	***3.0***
Adv Multiplicative P/W	***7.1***	***11.0***	***10.1***	***9.6***	***8.9***
Advanced Additive P/W	***10.3***	***8.2***	***5.3***	***7.2***	***10.3***
Total Part/Whole	***23.7***	***20.8***	***15.8***	***20.4***	***22.5***

Appendix D

Figures showing Patterns of Performance (Initial & Final stages) and Progress (Final Stage as a function of Initial stage) for Multiplication/Division and Fractions/Ratios

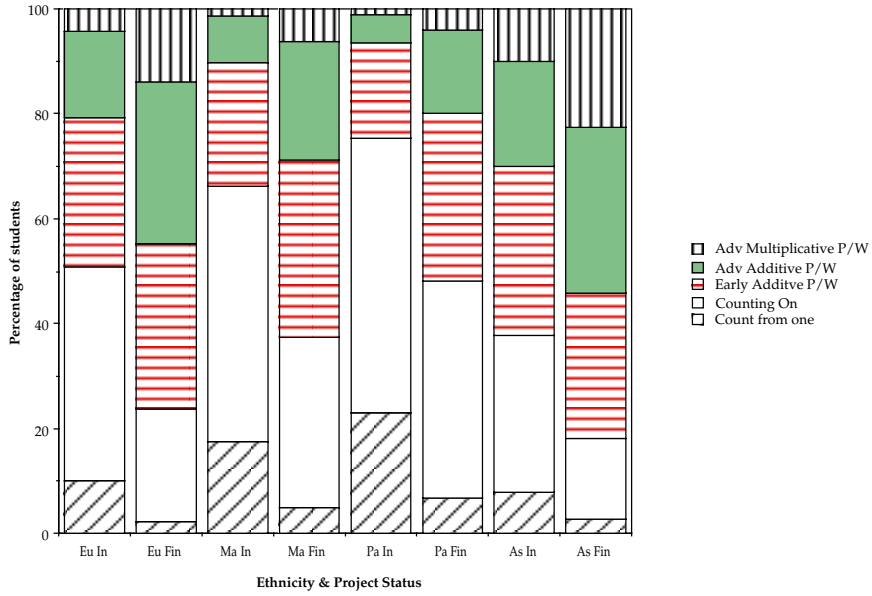

Figure D1. Percentages of ANP students in 2002 at each framework stage on Multiplication/Division at the start and end of the project as a function of Ethnicity

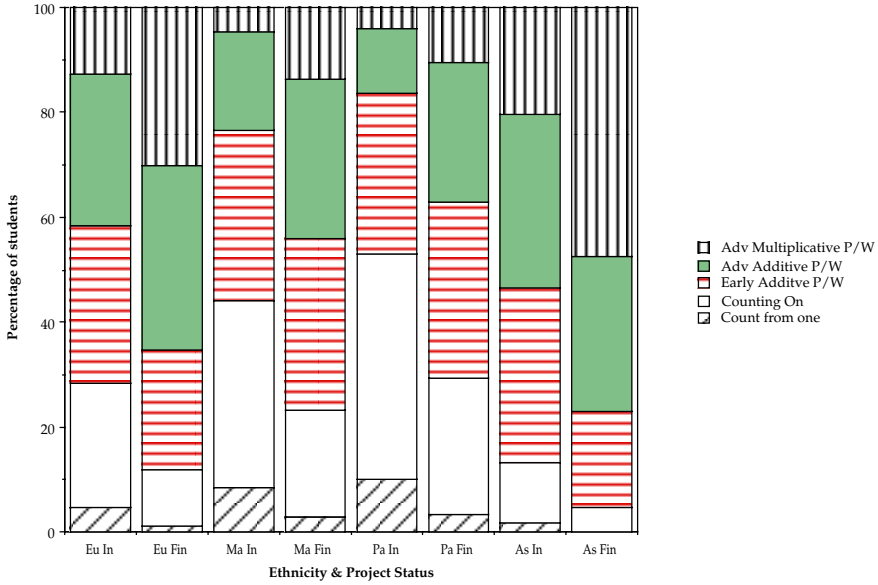

Figure D2. Percentages of INP students in 2002 at each framework stage on Multiplication/Division at the start and end of the project as a function of Ethnicity

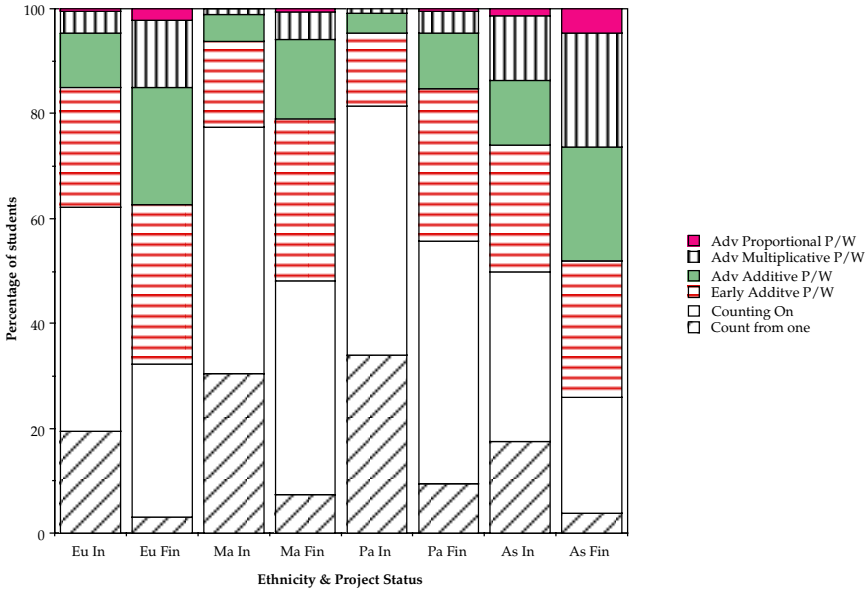

Figure D3. Percentages of ANP students in 2002 at each framework stage on Fractions/Ratios at the start and end of the project as a function of Ethnicity

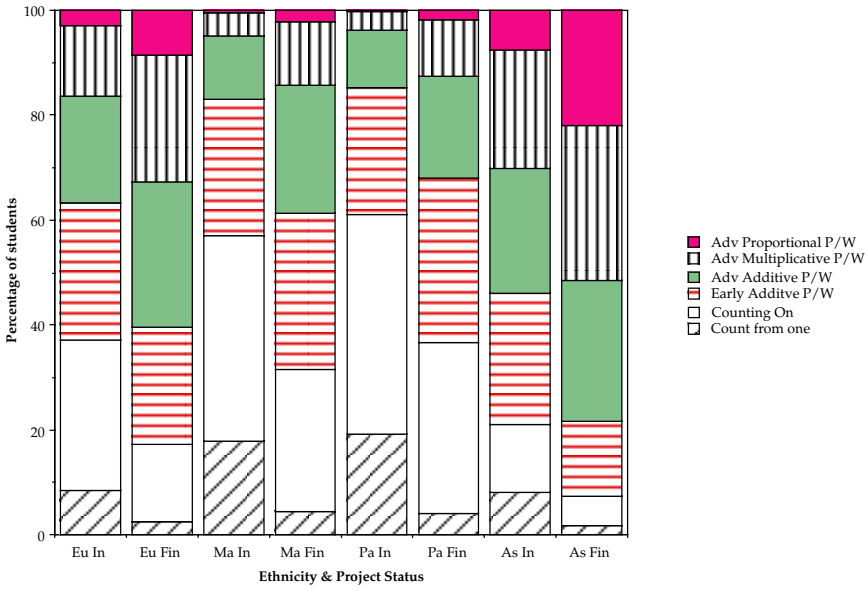

Figure D4. Percentages of INP students in 2002 at each framework stage on Fractions/Ratios at the start and end of the project as a function of Ethnicity

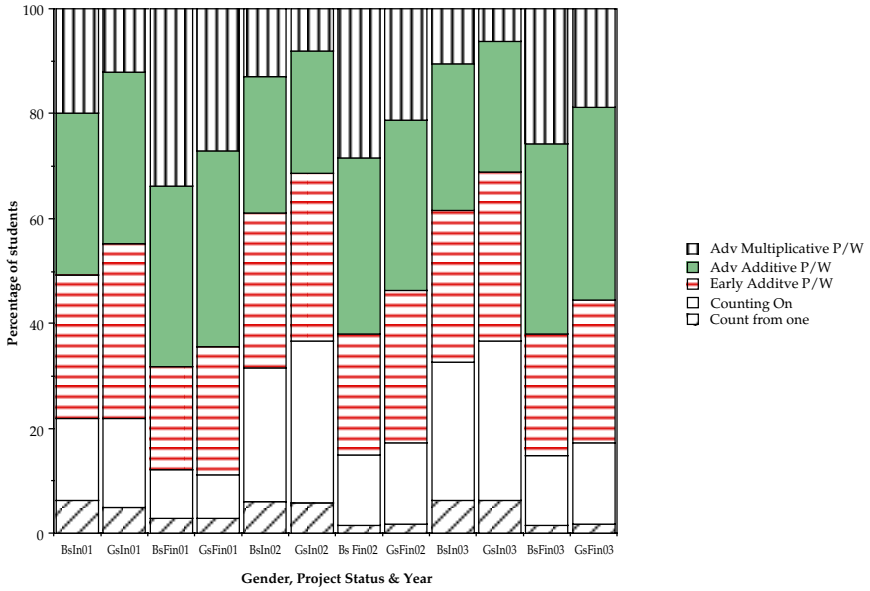

Figure D5. Percentages of ANP students at each framework stage on Multiplication/Division at the start and end of the project as a function of Gender (2001-2002)

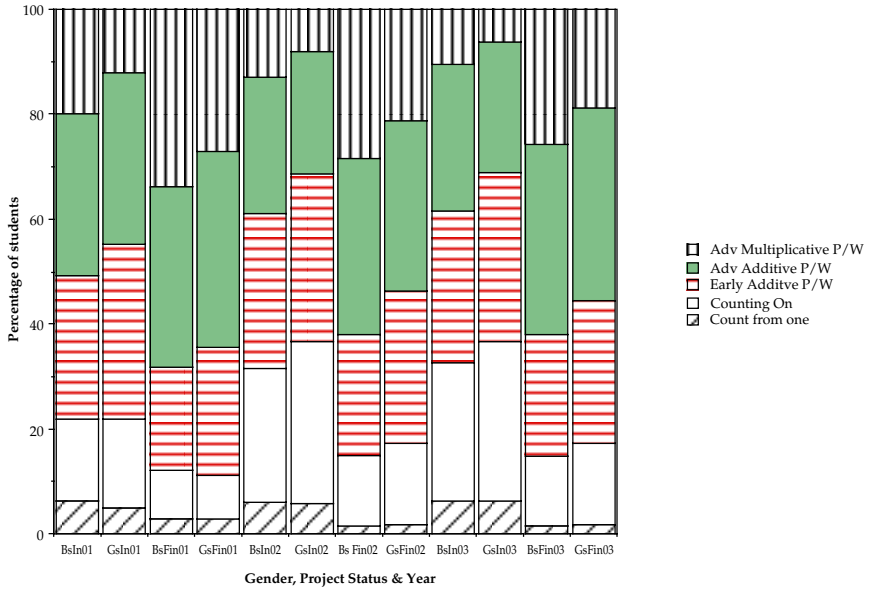

Figure D6. Percentages of INP students at each framework stage on Multiplication/Division at the start and end of the project as a function of Gender (2001-2002)

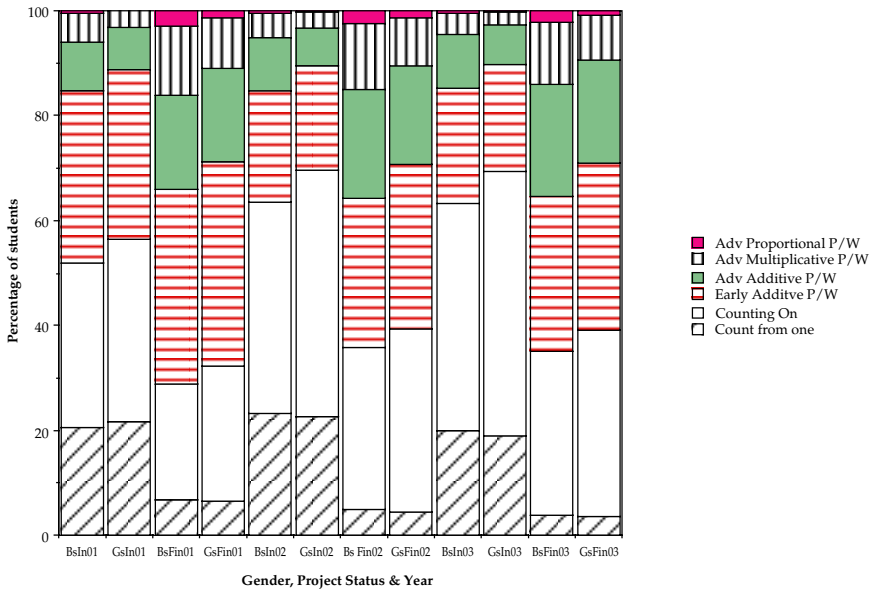

Figure D7. Percentages of ANP students at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Gender (2001-2003)

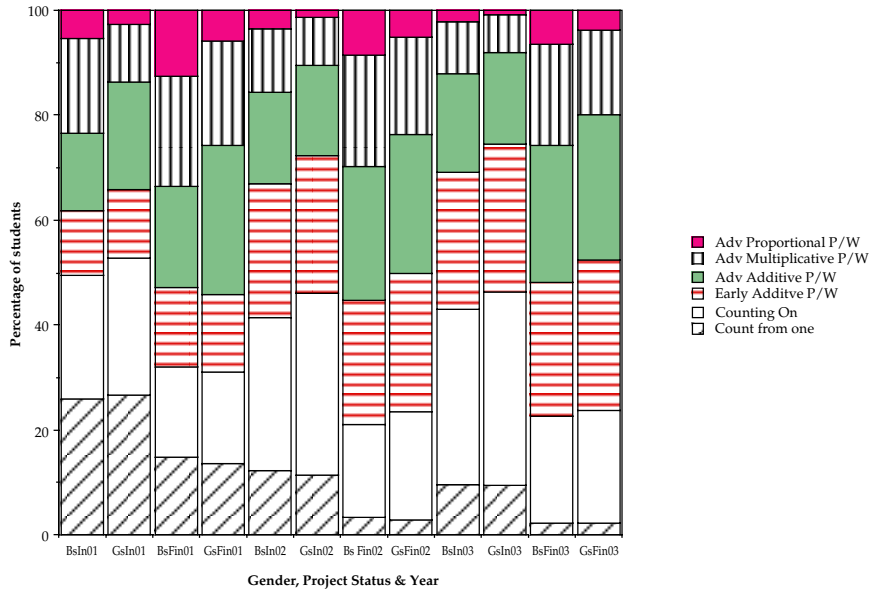

Figure D8. Percentages of INP students at each framework stage on Fractions/Ratios at the beginning and end of the project as a function of Gender (2001-2003)

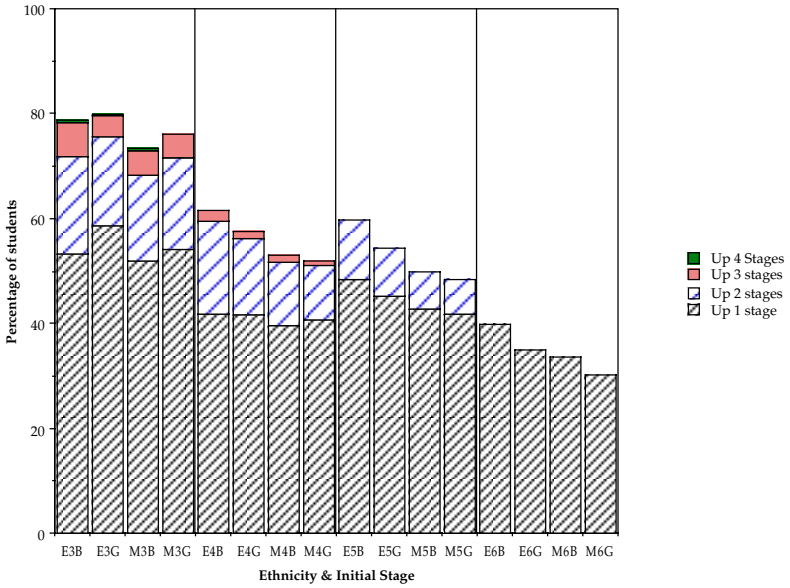

Figure D9. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for Multiplication/Division as a function of Initial Stage, Ethnicity and Gender (Eu & Ma)

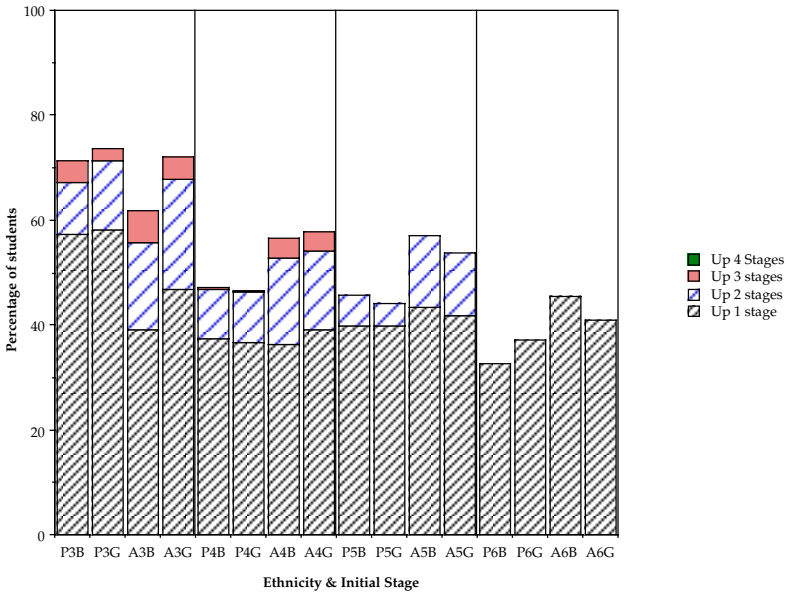

Figure D10. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for Multiplication/Division as a function of Initial Stage, Ethnicity and Gender (Pa & As)

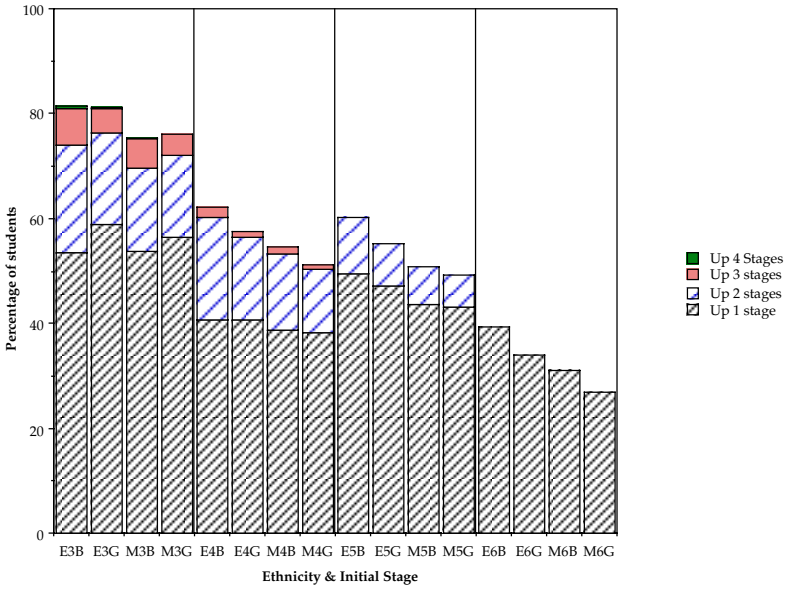

Figure D11. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for Multiplication/Division as a function of Initial Stage, Ethnicity and Gender (Eu & Ma)

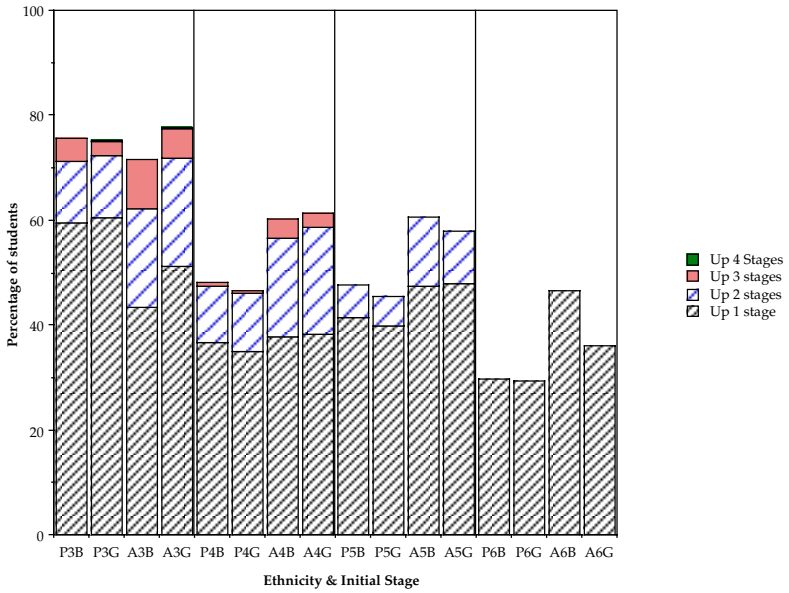

Figure D12. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for Multiplication/Division as a function of Initial Stage, Ethnicity and Gender (Pa & As)

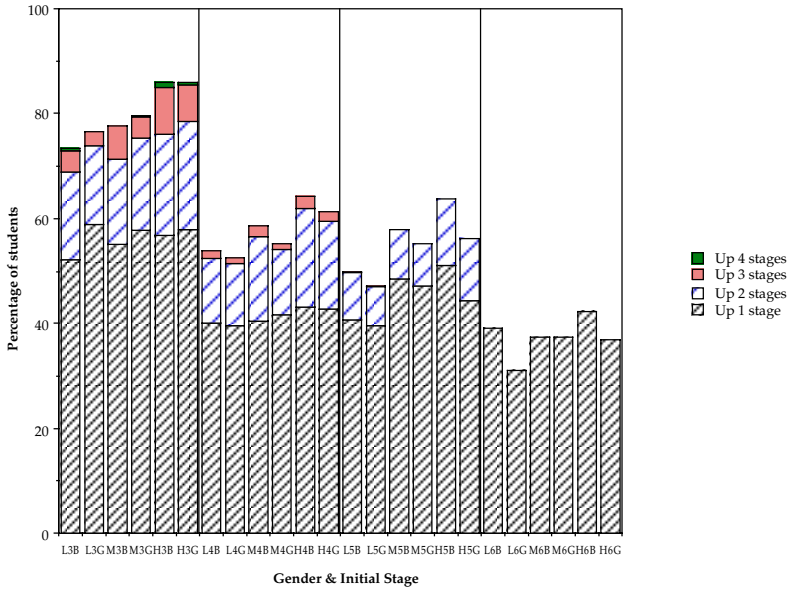

Figure D13. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage on Multiplication/Division as a function of Initial Level, Decile and Gender

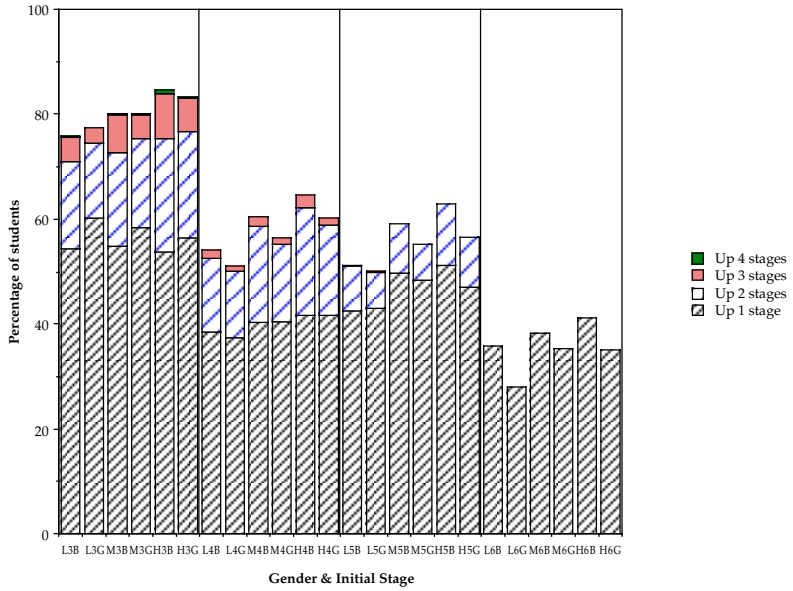

Figure D14. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage on Multiplication/Division as a function of Initial Level, Decile and Gender

Appendix E

Tables showing increases in percentages of students at particular stages on the number framework

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Table E1. Increase in percentages of students at stages 5 to 7 on the number framework for Multiplication/Division for the ANP and INP projects

			Ethnicity		
Stage	NZ Eur	Māori	Pasifika	Asian	Overall
	Advanced Numeracy Project (Years 4-6)				
2001	*(n=5139)*	*(n=1471)*	*(n=770)*	*(n=483)*	*(n=8094)*
Adv Multiplicative P/W	11.1	5.5	4.2	14.7	9.6
Adv Additive P/W	12.0	12.5	8.8	4.5	11.4
Total Part/Whole	25.4	27.5	24.8	19.4	25.5
2002	*(n=17792)*	*(n=6627)*	*(n=2454)*	*(n=1598)*	*(n=29767)*
Adv Multiplicative P/W	9.3	4.9	3.0	12.6	9.6
Advanced Additive P/W	14.4	13.7	10.6	11.7	21.0
Total Part/Whole	26.7	29.0	27.3	19.6	26.9
2003	*(n=30661)*	*(n=11170)*	*(n=3834)*	*(n=2465)*	*(n=50241)*
Adv Multiplicative P/W	9.4	4.7	3.2	13.1	8.1
Advanced Additive P/W	14.8	14.7	11.3	12.7	14.4
Total Part/Whole	26.8	29.0	27.6	20.5	27.1
	Intermediate Numeracy Project (Years 7-8)				
2001	*(n=1130)*	*(n=379)*	*(n=75)*	*(n=206)*	*(n=1878)*
Adv Multiplicative P/W	15.9	9.2	6.6	18.4	14.3
Advanced Additive P/W	3.6	10.5	8.0	-2.4	4.2
Total Part/Whole	9.3	17.6	12.0	3.8	10.4
2002	*(n=3464)*	*(n=1589)*	*(n=522)*	*(n=303)*	*(n=6113)*
Adv Multiplicative P/W	17.2	8.9	6.3	27.0	14.5
Adv Additive P/W	6.5	11.7	14.3	-3.6	8.2
Total Part/Whole	16.4	21.0	23.6	8.6	17.9
2003	*(n=6899)*	*(n=3560)*	*(n=1180)*	*(n=562)*	*(n=12646)*
Adv Multiplicative P/W	17.1	8.3	7.2	25.6	14.0
Advanced Additive P/W	8.0	13.4	14.5	0.4	9.9
Total Part/Whole	16.7	22.1	23.8	11.0	18.6

Table E2. Increase in percentages of students at stages 5 to 8 on the number framework for Fractions/Ratios for the ANP and INP projects

Stage	Ethnicity: NZ Eur	Māori	Pasifika	Asian	Overall
	Advanced Numeracy Project (Years 4-6)				
ANP01	*(n=5139)*	*(n=1471)*	*(n=770)*	*(n=483)*	*(n=8094)*
AdvProportional P/W	1.8	1.3	0.7	4.4	1.8
Adv Multiplicative P/W	8.5	3.3	3.4	8.7	7.0
Adv Additive P/W10.5	10.5	8.9	4.6	5.8	10.5
Total Part/Whole	23.2	27.1	19.5	21.0	23.5
ANP02	*(n=17719)*	*(n=6557)*	*(n=2429)*	*(n=1583)*	*(n=29587)*
Adv Proportional P/W	1.6	0.4	0.4	3.6	1.4
Adv Multiplicative P/W	8.7	3.9	3.3	9.4	7.2
Advanced Additive P/W	11.8	10.3	6.9	9.1	11.0
Total Part/Whole	29.8	29.0	25.8	24.1	29.1
ANP03	*(n=30562)*	*(n=10922)*	*(n=3718)*	*(n=2439)*	*(n=49731)*
Adv Proportional P/W	1.5	0.3	0.2	3.3	1.3
Adv Multiplicative P/W	8.4	3.5	3.4	9.7	6.9
Adv Additive P/W	12.2	10.7	8.0	10.5	11.5
Total Part/Whole	30.0	28.6	27.0	24.7	29.2
	Advanced Numeracy Project (Years 4-6)				
INP01	*(n=1130)*	*(n=379)*	*(n=75)*	*(n=206)*	*(n=1878)*
Adv Proportional P/W	5.1	2.9	2.7	8.7	5.3
Adv Multiplicative P/W	8.2	3.7	0.0	3.0	5.9
Adv Additive P/W	5.5	9.0	5.4	0.9	6.0
Total Part/Whole	20.7	20.0	17.4	9.2	19.4
INP02	*(n=3431)*	*(n=1581)*	*(n=520)*	*(n=299)*	*(n=6065)*
Adv Proportional P/W	5.3	1.9	1.5	14.7	4.6
Adv Multiplicative P/W	10.9	7.8	7.3	6.7	9.3
Advanced Additive P/W	7.2	12.0	8.6	3.1	8.5
Total Part/Whole	19.9	25.7	24.4	13.8	21.5
INP03	*(n=6865)*	*(n=3520)*	*(n=1171)*	*(n=554)*	*(n=12552)*
Adv Proportional P/W	4.3	1.4	1.0	12.2	3.6
Adv Multiplicative P/W	11.4	6.8	5.9	8.2	9.3
Advanced Additive P/W	7.6	11.3	9.9	3.6	8.7
Total Part/Whole	19.8	24.4	25.8	15.2	21.5

Table E3. Increase in percentages of students at upper stages on the number framework for the ENP, ANP, and INP projects as a function of Gender

	2001		2002		2003	
Stage	Boys	Girls	Boys	Girls	Boys	Girls
			Addition/Subtraction			
ENP	*(n=17198)*	*(n=16004)*	*(n=10624)*	*(n=10305)*	*(n=28620)*	*(n=27635)*
Advanced Additive P/W	4.2	2.5	2.4	0.9	2.4	0.8
Total Part/Whole	17.2	15.3	14.6	12.1	14.8	12.1
ANP						
Initially	*(n=4169)*	*(n=3925)*	*(n=17575)*	*(n=16460)*	*(n=29280)*	*(n=28036)*
Advanced Additive P/W	22.6	20.9	14.1	12.2	14.6	12.0
Total Part/Whole	24.8	30.2	22.7	27.2	22.4	25.7
INP						
Initially	*(n=986)*	*(n=892)*	*(n=3330)*	*(n=3088)*	*(n=6937)*	*(n=6523)*
Advanced Additive P/W	19.4	20.8	16.3	16.0	17.6	17.6
Total Part/Whole	14.5	16.2	15.9	19.4	15.8	18.6
			Multiplication/Division			
ANP	*(n=4169)*	*(n=3925)*	*(n=15279)*	*(n=14488)*	*(n=25494)*	*(n=24747)*
Adv Multiplicative P/W	11.2	7.7	9.6	6.4	9.8	6.3
Advanced Additive P/W	10.1	12.6	13.0	14.5	13.6	15.3
Total Part/Whole	24.7	25.9	25.5	28.6	25.9	28.3
INP	*(n=986)*	*(n=892)*	*(n=3159)*	*(n=2954)*	*(n=6500)*	*(n=6146)*
Adv Multiplicative P/W	13.7	15.0	15.6	13.2	15.3	12.6
Advanced Additive P/W	3.8	4.7	7.4	9.2	8.2	11.8
Total Part/Whole	10.0	10.9	16.6	19.4	17.9	19.4
			Fractions/Ratios			
ANP	*(n=4169)*	*(n=3925)*	*(n=15184)*	*(n=14403)*	*(n=25256)*	*(n=24475)*
Adv Proportional P/W	2.4	1.1	1.8	1.0	1.7	0.9
Adv Multiplicative P/W	7.5	6.4	8.0	6.2	7.8	6.0
Advanced Additive P/W	8.9	9.9	10.6	11.3	11.2	11.9
Total Part/Whole	22.8	23.9	27.7	30.1	28.3	30.3
INP	*(n=986)*	*(n=892)*	*n=3135)*	*(n=2930)*	*(n=6455)*	*(n=6097)*
Adv Proportional P/W	7.0	3.3	5.1	4.0	4.1	3.0
Adv Multiplicative P/W	3.1	8.9	9.3	9.4	9.6	8.9
Advanced Additive P/W	4.4	7.9	7.9	9.1	7.2	10.3
Total Part/Whole	17.2	21.8	20.6	22.6	20.4	22.5

Table E4. Increase in percentages of ENP and ANP students at upper stages on the number framework as a function of Ethnicity and Gender (2001 & 2002)

	NZ Eur	Māori	Pasifika	Asian
	Addition/Subtraction			
ENP 2001				
Boys	*(n=9965)*	*(n=4089)*	*(n=1843)*	*(n=730)*
Advanced Additive P/W	5.0	3.0	1.1	7.0
Total Part/Whole	19.9	14.2	8.6	20.7
Girls	*(n=9522)*	*(n=3587)*	*(n=1711)*	*(n=633)*
Advanced Additive P/W	2.8	1.9	0.9	4.7
Total Part/Whole	17.5	11.8	8.3	20.1
ENP 2002				
Boys	*(n=6257)*	*(n=2378)*	*(n=1061)*	*(n=507)*
Advanced Additive P/W	2.6	1.6	0.1	3.7
Total Part/Whole	16.4	10.8	7.0	15.4
Girls	*(n=6160)*	*(n=2199)*	*(n=1060)*	*(n=497)*
Advanced Additive P/W	1.0	0.5	0.1	2.4
Total Part/Whole	14.0	9.2	6.4	13.6
ANP 2002				
Boys	*(n=10066)*	*(n=4233)*	*(n=1659)*	*(n=876)*
Advanced Additive P/W	16.9	10.6	6.2	15.4
Total Part/Whole	21.8	26.1	24.4	16.7
Girls	*(n=9534)*	*(n=3804)*	*(n=1534)*	*(n=824)*
Advanced Additive P/W	14.3	9.2	5.1	15.3
Total Part/Whole	27.0	29.2	26.7	20.0
	Multiplication/Division			
ANP 2002				
Boys	*(n=9110)*	*(n=3468)*	*(n=1248)*	*(n=815)*
Advanced Multiplicative P/W	11.5	5.5	3.0	14.0
Advanced Additive P/W	13.3	13.5	11.1	10.9
Total Part/Whole	24.7	28.4	26.2	18.8
Girls	*(n=8682)*	*(n=3159)*	*(n=1206)*	*(n=783)*
Advanced Multiplicative P/W	7.1	4.2	2.8	11.1
Advanced Additive P/W	15.7	13.9	10.2	12.6
Total Part/Whole	29.1	29.6	28.4	20.6
	Fractions/Ratios			
ANP 2002				
Boys	*(n=9080)*	*(n=3431)*	*(n=1227)*	*(n=809)*
Adv Proportional P/W	2.3	0.6	0.3	3.7
Adv Multiplicative P/W	10.0	4.1	3.8	9.1
Advanced Additive P/W	11.0	11.3	6.0	9.0
Total Part/Whole	28.7	28.8	24.6	22.2
Girls	*(n=8639)*	*(n=3126)*	*(n=1202)*	*(n=774)*
Adv Proportional P/W	1.1	0.3	0.4	3.3
Adv Multiplicative P/W	7.3	3.7	2.9	9.7
Advanced Additive P/W	12.6	9.4	7.7	9.2
Total Part/Whole	36.1	29.6	26.9	25.8

Table E5. Increase in percentages of ENP and ANP students at upper stages on the number framework as a function of Gender and Decile (2001 & 2002)

	School Decile Level		
	Low (1-3)	Med (4-7)	Hi (8-10)
	Addition/Subtraction		
ENP 2001			
Boys	*(n=6328)*	*(n=6391)*	*(n=4261)*
Advanced Additive P/W	2.9	3.9	6.6
Total Part/Whole	12.9	18.2	22.1
Girls	*(n=5751)*	*(n=6152)*	*(n=3830)*
Advanced Additive P/W	1.6	2.6	3.8
Total Part/Whole	11.5	16.1	19.7
ENP 2002			
Boys	*(n=3653)*	*(n=3720)*	*(n=2849)*
Advanced Additive P/W	1.2	2.3	3.5
Total Part/Whole	10.5	14.8	18.1
Girls	*(n=3568)*	*(n=3583)*	*(n=2703)*
Advanced Additive P/W	0.5	1.1	1.2
Total Part/Whole	9.0	12.2	15.9
ANP 2002			
Girls	*(n=5515)*	*(n=6057)*	*(n=4137)*
Advanced Part/Whole	9.0	13.1	16.0
Total Part/Whole	27.5	27.6	27.4
Boys	*(n=5882)*	*(n=6394)*	*(n=4519)*
Advanced Part/Whole	9.9	15.7	18.2
Total Part/Whole	25.1	22.9	19.7
	Multiplication/Divison		
ANP 2002			
Boys	*(n=4754)*	*(n=5661)*	*(n=4200)*
Advanced Multiplicative P/W	7.2	9.4	12.9
Advanced Additive P/W	10.8	14.6	13.7
Total Part/Whole	28.7	25.5	22.9
Girls	*(n=4579)*	*(n=5423)*	*(n=3849)*
Advanced Multiplicative P/W	4.4	6.3	9.1
Advanced Additive P/W	12.2	15.7	16.2
Total Part/Whole	29.2	29.1	28.8
	Fractions/Ratios		
ANP 2002			
Boys	*(n=4711)*	*(n=5636)*	*(n=4182)*
Adv Proportional P/W	0.8	1.8	3.1
Adv Multiplicative P/W	5.5	8.6	10.4
Advanced Additive P/W	8.6	11.1	12.7
Total Part/Whole	27.7	28.5	28.0
Girls	*(n=4554)*	*(n=5392)*	*(n=3827)*
Adv Proportional P/W	0.6	0.8	1.8
Adv Multiplicative P/W	3.7	6.6	8.8
Advanced Additive P/W	10.0	11.4	13.5
Total Part/Whole	28.6	31.6	31.7

Table E6. Increase in percentages of ENP and ANP students at upper stages on the number framework as a function of Decile and Ethnicity (2001 & 2002)

Stage	Ethnicity NZ Eur	Māori	Pasifika	Asian
	Addition/Subtraction			
ENP 2001				
Low Decile	*(n=3694)*	*(n=4661)*	*(n=2857)*	*(n=384)*
Advanced Additive P/W	3.1	2.1	1.0	3.4
Total Part/Whole	15.2	12.2	8.1	17.0
Medium Decile	*(n=8999)*	*(n=2367)*	*(n=545)*	*(n=317)*
Advanced Additive P/W	3.2	3.3	1.2	6.6
Total Part/Whole	18.2	14.6	10.2	20.8
High Decile	*(n=6515)*	*(n=520)*	*(n=98)*	*(n=651)*
Advanced Additive P/W	5.5	2.8	0.0	7.2
Total Part/Whole	21.6	16.5	10.2	21.9
ENP 2002				
Low Decile	*(n=2144)*	*(n=2969)*	*(n=1654)*	*(n=203)*
Advanced Additive P/W	1.3	0.9	0.0	2.5
Total Part/Whole	12.7	9.7	5.8	13.8
Medium Decile	*(n=4981)*	*(n=1257)*	*(n=330)*	*(n=417)*
Advanced Additive P/W	1.7	1.1	0.0	4.0
Total Part/Whole	14.8	9.7	7.9	13.5
High Decile	*(n=4739)*	*(n=282)*	*(n=69)*	*(n=264)*
Advanced Additive P/W	2.3	2.5	1.5	3.0
Total Part/Whole	17.0	15.6	14.6	18.9
ANP 2002				
Low Decile	*(n=3466)*	*(n=4748)*	*(n=2320)*	*(n=435)*
Advanced Additive P/W	13.5	8.4	4.9	13.4
Total Part/Whole	25.4	27.9	24.5	24.6
Medium Decile	*(n=8640)*	*(n=2446)*	*(n=532)*	*(n=353)*
Advanced Additive P/W	15.5	12.0	7.3	19.6
Total Part/Whole	24.4	27.5	27.8	25.3
High Decile	*(n=6710)*	*(n=569)*	*(n=117)*	*(n=724)*
Advanced Additive P/W	17.5	14.8	12.8	16.7
Total Part/Whole	24.2	26.6	29.9	13.1

Table E6. Increase in percentages of ENP and ANP students at upper stages on the number framework as a function of Decile and Ethnicity (2001 & 2002) (contd)

Stage	Ethnicity NZ Eur	Māori	Pasifika	Asian
	Multiplication/Divison			
ANP 2002				
Low Decile	*(n=3021)*	*(n=3830)*	*(n=1766)*	*(n=387)*
Adv Multiplicative P/W	9.2	4.3	2.5	8.8
Advanced Additive P/W	11.8	12.4	9.9	9.3
Total Part/Whole	29.3	30.3	26.6	23.5
Medium Decile	*(n=7808)*	*(n=2089)*	*(n=440)*	*(n=329)*
Adv Multiplicative P/W	8.6	5.4	3.2	13.1
Advanced Additive P/W	14.9	16.1	12.7	16.1
Total Part/Whole	26.9	28.1	29.1	26.1
High Decile	*(n=6233)*	*(n=518)*	*(n=109)*	*(n=696)*
Adv Multiplicative P/W	10.8	7.9	9.1	15.9
Advanced Additive P/W	15.5	14.9	13.8	11.5
Total Part/Whole	26.7	25.3	26.5	17.4
	Fractions/Ratios			
ANP02				
Low Decile	*(n=3000)*	*(n=3789)*	*(n=1757)*	*(n=382)*
Adv Proportional P/W	1.2	0.3	0.2	1.5
Adv Multiplicative P/W	7.4	3.2	2.8	7.3
Advanced Additive P/W	10.9	8.8	6.7	11.6
Total Part/Whole	29.9	27.4	26.3	28.5
Medium Decile	*(n=7789)*	*(n=2070)*	*(n=432)*	*(n=323)*
Adv Proportional P/W	1.5	0.4	0.7	2.5
Adv Multiplicative P/W	8.4	4.8	4.6	9.0
Advanced Additive P/W	11.2	12.4	7.4	9.3
Total Part/Whole	30.0	31.2	23.8	27.6
High Decile	*(n=6203)*	*(n=513)*	*(n=109)*	*(n=692)*
Adv Proportional P/W	2.2	1.1	2.8	5.2
Adv Multiplicative P/W	9.9	5.3	8.2	12.0
Advanced Additive P/W	13.7	14.2	8.2	7.5
Total Part/Whole	30.8	33.8	28.3	22.7

Appendix F

Percentage of students who progressed to a higher stage on the framework for each operational domain as a function of Initial Stage (Patterns of Progress)

Table F1. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for all three domains as a function of Initial Stage, Ethnicity and Gender

	European		Māori		Pasifika		Asian	
Initial Stage	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
			Addition/Subtraction					
Stage 3	*(n=4637)*	*(n=4687)*	*(n=2360)*	*(n=2145)*	*(n=1193)*	*(n=1082)*	*(n=338)*	*(n=339)*
No progress	***59.5***	***60.9***	***66.2***	***66.4***	***67.5***	***68.7***	***62.1***	***61.4***
Up 1	32.7	33.4	27.5	28.8	27.6	28.5	31.4	33.6
Up 2	6.8	5.1	5.9	4.7	4.6	2.6	5.9	3.8
Up 3	1.0	0.6	0.5	0.1	0.3	0.3	0.6	1.2
Stage 4	*(n=5451)*	*(n=6619)*	*(n=2806)*	*(n=2852)*	*(n=1193)*	*(n=1256)*	*(n=408)*	*(n=490)*
No progress	***40.3***	***45.4***	***48.6***	***48.6***	***57.1***	***58.0***	***45.8***	***45.5***
Up 1	54.8	50.7	48.3	48.1	40.5	40.3	47.8	48.2
Up 2	4.8	3.9	3.2	3.4	2.4	1.8	6.4	6.3
Stage 5	*(n=5590)*	*(n=4886)*	*(n=1917)*	*(n=1536)*	*(n=504)*	*(n=448)*	*(n=449)*	*(n=417)*
No progress	***64.5***	***68.6***	***72.7***	***75.3***	***79.4***	***81.2***	***62.8***	***67.4***
Up 1	35.5	31.4	27.3	24.7	20.6	18.8	37.2	32.6
			Multiplication/Divison					
Stage 3	*(n=1438)*	*(n=1737)*	*(n=823)*	*(n=784)*	*(n=368)*	*(n=390)*	*(n=115)*	*(n=139)*
No progress	***21.3***	***20.1***	***26.6***	***23.9***	***28.5***	***26.4***	***38.3***	***28.1***
Up 1	53.1	58.7	51.9	54.2	57.3	58.2	39.1	46.8
Up 2	18.7	16.9	16.4	17.3	9.8	13.1	16.5	20.9
Up 3	6.4	4.1	4.7	4.6	4.3	2.3	6.1	4.3
Up 4	0.5	0.2	0.4	-	-	-	-	-
Stage 4	*(n=4444)*	*(n=5059)*	*(n=2135)*	*(n=2075)*	*(n=814)*	*(n=818)*	*(n=326)*	*(n=327)*
No progress	***38.4***	***42.5***	***47.0***	***48.0***	***52.8***	***53.4***	***43.5***	***42.2***
Up 1	41.9	41.7	39.5	40.7	37.3	36.8	36.2	39.1
Up 2	17.6	14.5	12.1	10.3	9.5	9.4	16.6	15.0
Up 3	2.1	1.3	1.4	1.0	0.4	0.4	3.7	3.7
Stage 5	*(n=3375)*	*(n=3056)*	*(n=1124)*	*(n=1006)*	*(n=322)*	*(n=299)*	*(n=324)*	*(n=330)*
No progress	***40.3***	***45.6***	***50.2***	***51.6***	***54.3***	***55.8***	***43.2***	***46.3***
Up 1	48.4	45.1	42.7	41.9	39.8	39.8	43.5	41.8
Up 2	11.3	9.2	7.1	6.5	5.9	4.3	13.3	11.8
Stage 6	*(n=2410)*	*(n=1608)*	*(n=519)*	*(n=368)*	*(n=98)*	*(n=97)*	*(n=242)*	*(n=195)*
No progress	***60.2***	***65.0***	***66.5***	***69.8***	***67.3***	***62.9***	***54.5***	***59.0***
Up 1	39.8	35.0	33.5	30.2	32.7	37.1	45.5	41.0

Table F1. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for all three domains as a function of Initial Stage, Ethnicity and Gender (contd)

	European		Māori		Pasifika		Asian	
Initial Stage	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
			Fractions/Ratios					
Stage 3	*(n=2585)*	*(n=2402)*	*(n=1428)*	*(n=1212)*	*(n=524)*	*(n=547)*	*(n=221)*	*(n=197)*
No progress	***17.3***	***14.4***	***20.4***	***22.3***	***21.6***	***25.0***	***21.3***	***18.8***
Up 1	53.2	57.6	56.5	55.5	62.2	58.7	48.4	52.3
Up 2	20.1	20.1	16.4	17.2	13.0	12.6	19.5	19.3
Up 3	8.1	6.6	6.0	4.5	2.9	2.7	9.0	8.6
Up 4	1.2	1.3	0.7	0.5	0.4	0.9	1.8	1.0
Up 5	0.1	0.1	-	-	-	-	-	-
Stage 4	*(n=4783)*	*(n=5376)*	*(n=2015)*	*(n=2044)*	*(n=742)*	*(n=758)*	*(n=336)*	*(n=386)*
No progress	***44.8***	***48.9***	***52.4***	***52.8***	***59.1***	***57.0***	***50.9***	***45.3***
Up 1	35.4	35.0	33.7	35.7	33.0	33.5	30.4	36.8
Up 2	15.6	13.0	12.3	9.9	6.5	7.7	14.3	12.4
Up 3	4.2	3.0	1.6	1.7	1.5	1.7	4.5	5.4
Up 4	0.1	0.1	0.0	-	-	0.1	-	-
Stage 5	*(n=2700)*	*(n=2430)*	*(n=818)*	*(n=703)*	*(n=248)*	*(n=220)*	*(n=254)*	*(n=230)*
No progress	***44.0***	***47.7***	***52.0***	***56.8***	***87.0***	***87.7***	***42.1***	***40.5***
Up 1	37.2	36.7	35.5	32.3	11.7	10.9	37.8	34.8
Up 2	17.3	15.0	12.0	10.5	1.2	1.4	17.3	23.5
Up 3	1.4	0.7	0.6	0.4	-	-	2.8	1.3
-								
Stage 6	*(n=1501)*	*(n=1090)*	*(n=300)*	*(n=225)*	*(n=76)*	*(n=75)*	*(n=154)*	*(n=120)*
No progress	***53.0***	***60.9***	***63.7***	***68.0***	***68.4***	***70.6***	***50.6***	***54.2***
Up 1	41.7	35.0	32.0	30.7	28.9	25.3	39.6	38.3
Up 2	5.2	4.1	4.3	1.3	2.6	4.0	9.7	7.5
Stage 7	*(n=756)*	*(n=458)*	*(n=88)*	*(n=65)*	*(n=15)*	*(n=24)*	*(n=138)*	*(n=126)*
No progress	***74.2***	***77.5***	***79.5***	***76.9***	***86.7***	***83.3***	***73.9***	***72.2***
Up 1	25.8	22.5	20.5	23.1	13.3	16.7	26.1	27.8

Table F2. Percentage of Year 0-8 students in 2002 who progressed to a higher framework stage for all three domains as a function of Initial Stage, School Decile Level & Gender

	Low Decile		Medium Decile		High Decile	
Initial Stage	Boys	Girls	Boys	Girls	Boys	Girls
Addition/Subtraction						
Stage 3	*(n=3538)*	*(n=3339)*	*(n=3083)*	*(n=2930)*	*(n=1962)*	*(n=1968)*
No progress	***65.2***	***66.6***	***61.1***	***63.3***	***58.2***	***56.8***
Up 1	29.3	29.6	30.9	30.7	33.6	37.6
Up 2	5.1	3.5	7.2	5.7	6.9	4.5
Up 3	0.3	0.2	0.8	0.3	1.4	1.2
Stage 4	*(n=3983)*	*(n=4174)*	*(n=3636)*	*(n=4398)*	*(n=2222)*	*(n=2674)*
No progress	***50.1***	***51.9***	***42.8***	***46.5***	***38.0***	***40.9***
Up 1	46.7	45.2	52.7	49.8	56.7	54.5
Up 2	3.2	2.9	4.5	3.7	5.3	4.6
Stage 5	*(n=2423)*	*(n=2112)*	*(n=3568)*	*(n=3022)*	*(n=2495)*	*(n=2143)*
No progress	***72.3***	***74.6***	***65.9***	***69.9***	***62.7***	***66.6***
Up 1	27.7	25.4	34.1	30.1	37.3	33.4
Multiplication/Division						
Stage 3	*(n=1142)*	*(n=1227)*	*(n=961)*	*(n=1139)*	*(n=557)*	*(n=624)*
No progress	***26.5***	***23.6***	***22.2***	***20.5***	***14.2***	***14.3***
Up 1	52.2	58.8	55.0	57.7	56.9	57.9
Up 2	16.8	15.1	16.4	17.6	19.2	20.7
Up 3	4.0	2.5	6.2	4.2	9.0	6.9
Up 4	0.4	-	0.1	0.1	0.7	0.3
Stage 4	*(n=2898)*	*(n=2936)*	*(n=3029)*	*(n=3373)*	*(n=1811)*	*(n=2013)*
No progress	***46.1***	***47.4***	***41.3***	***44.9***	***35.7***	***38.8***
Up 1	40.1	39.7	40.6	41.7	43.1	42.8
Up 2	12.3	11.8	16.1	12.5	18.8	16.6
Up 3	1.5	1.1	1.9	1.0	2.4	1.8
Stage 5	*(n=1437)*	*(n=1283)*	*(n=2119)*	*(n=1984)*	*(n=1546)*	*(n=1392)*
No progress	***50.3***	***53.0***	***42.1***	***44.8***	***36.2***	***43.9***
Up 1	40.8	39.6	48.5	47.3	50.9	44.3
Up 2	8.8	7.4	9.4	7.9	12.9	11.8
Stage 6	*(n=714)*	*(n=563)*	*(n=1412)*	*(n=887)*	*(n=1136)*	*(n=785)*
No progress	***60.8***	***68.9***	***62.6***	***62.6***	***57.8***	***63.1***
Up 1	39.2	31.1	37.4	37.4	42.2	36.9
Fractions/Ratios						
Stage 3	*(n=1812)*	*(n=1675)*	*(n=1839)*	*(n=1767)*	*(n=1135)*	*(n=930)*
No progress	***20.5***	***21.9***	***18.3***	***15.6***	***15.6***	***13.0***
Up 1	57.5	56.7	55.6	58.3	50.2	56.1
Up 2	16.3	17.1	18.4	18.6	22.5	21.1
Up 3	5.3	3.9	6.7	6.0	9.8	8.3
Up 4	0.4	0.4	1.0	1.4	1.9	1.5
Up 5	0.1	-	0.1	0.1	0.1	-
Stage 4	*(n=2781)*	*(n=2958)*	*(n=3100)*	*(n=3446)*	*(n=1898)*	*(n=2148)*
No progress	***53.7***	***55.0***	***46.2***	***48.4***	***40.8***	***44.1***
Up 1	34.3	33.0	35.2	36.7	35.1	36.7
Up 2	10.0	10.1	14.8	12.1	19.2	14.8
Up 3	1.8	1.9	3.8	2.7	4.7	4.3
Up 4	0.1	0.0	0.1	0.1	0.1	0.1
Stage 5	*(n=1067)*	*(n=967)*	*(n=1652)*	*(n=1452)*	*(n=1275)*	*(n=1110)*
No progress	***50.7***	***53.4***	***46.1***	***48.9***	***39.1***	***44.1***
Up 1	34.4	34.1	37.3	36.5	39.5	36.4
Up 2	14.3	11.8	15.5	14.0	19.1	18.4
Up 3	0.7	0.6	1.1	0.6	2.4	1.2
Stage 6	*(n=459)*	*(n=344)*	*(n=857)*	*(n=629)*	*(n=692)*	*(n=497)*
No progress	***59.3***	***66.6***	***54.1***	***62.4***	***50.7***	***57.9***
Up 1	36.4	29.7	40.5	33.9	42.5	37.8
Up 2	4.4	3.8	5.4	3.8	6.8	4.2
Stage 7	*(n=162)*	*(n=120)*	*(n=397)*	*(n=247)*	*(n=438)*	*(n=307)*
No progress	***82.1***	***78.3***	***74.8***	***79.8***	***72.8***	***72.0***
Up 1	17.9	21.7	25.2	20.2	27.2	28.0

Table F3. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for all three domains as a function of Initial Stage, Ethnicity and Gender

Stage	European Boys	European Girls	Māori Boys	Māori Girls	Pasifika Boys	Pasifika Girls	Asian Boys	Asian Girls
Addition/Subtraction								
Stage 3	*(n=12205)*	*(n=12238)*	*(n=5952)*	*(n=5433)*	*(n=2962)*	*(n=2760)*	(n=961)	(n=884)
No progress	***58.0***	***58.9***	***65.0***	***64.3***	***66.6***	***67.4***	***53.7***	***56.7***
Up 1	33.8	35.5	29.4	31.4	28.3	29.2	35.1	37.3
Up 2	7.7	5.3	5.4	4.2	4.9	3.1	9.8	5.1
Up 3	0.6	0.4	0.3	0.1	0.2	0.2	1.5	0.9
Stage 4	*(n=10671)*	*(n=12764)*	*(n=5226)*	*(n=5410)*	*(n=2057)*	*(n=2265)*	*(n=766)*	*(n=917)*
No progress	***41.1***	***47.3***	***49.0***	***51.4***	***58.2***	***59.4***	***43.1***	***45.5***
Up 1	54.0	49.1	47.3	45.1	39.2	38.0	50.8	49.2
Up 2	4.9	3.5	3.7	3.4	2.5	2.6	6.1	5.3
Stage 5	*(n=10544)*	*(n=9361)*	*(n=3460)*	*(n=2857)*	*(n=962)*	*(n=898)*	*(n=869)*	*(n=801)*
No progress	***65.1***	***70.5***	***71.1***	***75.2***	***77.9***	***79.0***	***64.3***	***68.3***
Up 1	34.9	29.5	28.9	24.8	22.1	21.0	35.7	31.7
Multiplication/Division								
Stage 3	*(n=3191)*	*(n=3833)*	*(n=1688)*	*(n=1644)*	*(n=750)*	*(n=781)*	*(n=297)*	*(n=310)*
No progress	***18.5***	***18.9***	***24.6***	***23.8***	***24.3***	***24.8***	***28.3***	***22.3***
Up 1	53.5	58.9	53.8	56.4	59.6	60.4	43.4	51.3
Up 2	20.6	17.4	15.8	15.6	11.6	11.9	18.9	20.6
Up 3	6.9	4.6	5.6	4.0	4.5	2.7	9.4	5.5
Up 4	0.5	0.2	0.2	0.1	-	0.1	-	0.3
Stage 4	*(n=8361)*	*(n=9176)*	*(n=3853)*	*(n=3804)*	*(n=1338)*	*(n=1434)*	*(n=559)*	*(n=586)*
No progress	***37.8***	***42.4***	***45.5***	***48.7***	***51.7***	***53.5***	***39.9***	***38.7***
Up 1	40.8	40.7	38.7	38.3	36.7	34.8	37.7	38.2
Up 2	19.4	15.7	14.5	12.1	10.8	11.2	19.0	20.5
Up 3	2.0	1.2	1.3	0.8	0.7	0.6	3.4	2.6
Stage 5	*(n=5941)*	*(n=5557)*	*(n=1980)*	*(n=1849)*	*(n=546)*	*(n=529)*	*(n=527)*	*(n=527)*
No progress	***40.0***	***44.9***	***49.4***	***50.7***	***52.4***	***54.6***	***39.3***	***42.0***
Up 1	49.4	47.2	43.7	43.2	41.4	39.9	47.4	47.8
Up 2	10.7	8.0	7.0	6.1	6.2	5.5	13.3	10.2
Stage 6	*(n=4522)*	*(n=3221)*	*(n=1002)*	*(n=751)*	*(n=222)*	*(n=214)*	*(n=445)*	*(n=371)*
No progress	***60.6***	***66.0***	***68.9***	***73.2***	***70.3***	***70.6***	***53.5***	***63.9***
Up 1	39.4	34.0	31.1	26.8	29.7	29.4	46.5	36.1
Fractions/Ratios								
Stage 3	*(n=4395)*	*(n=4028)*	*(n=2269)*	*(n=1988)*	*(n=843)*	*(n=887)*	*(n=412)*	*(n=365)*
No progress	***15.2***	***13.7***	***18.8***	***19.9***	***17.9***	***20.2***	***17.5***	***14.5***
Up 1	55.8	60.6	58.6	58.8	64.2	62.8	51.2	57.3
Up 2	20.7	18.9	16.7	16.3	14.4	14.1	19.9	19.2
Up 3	7.3	5.8	5.2	4.6	3.1	2.4	10.2	8.2
Up 4	1.0	0.9	0.7	0.4	0.5	0.6	1.2	0.8
Up 5	0.0	0.0	-	-	-	-	-	-
Stage 4	*(n=9751)*	*(n=10902)*	*(n=4031)*	*(n=4110)*	*(n=1380)*	*(n=1459)*	*(n=654)*	*(n=738)*
No progress	***45.7***	***50.4***	***55.6***	***55.8***	***59.9***	***58.3***	***48.9***	***45.8***
Up 1	35.7	34.4	32.0	33.5	30.7	31.4	31.8	36.3
Up 2	14.8	12.8	10.9	9.6	8.0	8.6	15.9	14.0
Up 3	3.6	2.4	1.4	1.2	1.4	1.6	3.2	3.8
Up 4	0.1	0.1	0.1	-	-	0.1	0.2	0.1
Stage 5	*(n=4958)*	*(n=4555)*	*(n=1520)*	*(n=1337)*	*(n=421)*	*(n=401)*	*(n=427)*	*(n=391)*
No progress	***46.1***	***49.1***	***54.5***	***58.6***	***59.6***	***60.3***	***40.0***	***43.5***
Up 1	37.5	37.5	34.5	32.6	28.3	30.9	41.0	37.3
Up 2	15.3	12.9	10.6	8.2	11.2	8.0	17.1	18.4
Up 3	1.1	0.5	0.3	0.6	1.0	0.7	1.9	0.8
Stage 6	*(n=2768)*	*(n=2060)*	*(n=543)*	*(n=399)*	*(n=127)*	*(n=136)*	*(n=289)*	*(n=230)*
No progress	***53.8***	***60.1***	***66.5***	***66.7***	***69.3***	***70.6***	***51.9***	***56.5***
Up 1	41.4	36.2	30.0	31.6	29.1	27.2	38.4	37.8
Up 2	4.7	3.7	3.5	1.8	1.6	2.2	9.7	5.7
Stage 7	*(n=1176)*	*(n=706)*	*(n=152)*	*(n=99)*	*(n=28)*	*(n=33)*	*(n=197)*	*(n=156)*
No progress	***73.4***	***77.9***	***84.2***	***82.8***	***82.1***	***84.8***	***72.1***	***71.2***
Up 1	26.6	22.1	15.8	17.2	17.9	15.2	27.9	28.8

Table F4. Percentage of Year 0-8 students in 2003 who progressed to a higher framework stage for all three domains as a function of Initial Stage, School Decile and Gender

Stage	Low Decile Boys	Low Decile Girls	Medium Decile Boys	Medium Decile Girls	High Decile Boys	High Decile Girls
Addition/Subtraction						
Stage 3	*(n=7433)*	*(n=7272)*	*(n=7101)*	*(n=6855)*	*(n=4999)*	*(n=5154)*
No progress	***59.5***	***61.0***	***56.5***	***58.6***	***52.3***	***52.3***
Up 1	34.6	35.2	35.6	35.9	38.5	41.9
Up 2	5.8	3.8	7.6	5.4	9.0	5.6
Up 3	0.1	0.1	0.3	0.1	0.2	0.2
Stage 4	*(n=7365)*	*(n=7753)*	*(n=7024)*	*(n=8227)*	*(n=4540)*	*(n=5553)*
No progress	***50.0***	***53.6***	***43.4***	***48.4***	***38.3***	***44.0***
Up 1	46.0	43.2	52.3	48.0	56.5	52.3
Up 2	3.9	3.2	4.4	3.6	5.3	3.7
Stage 5	*(n=4537)*	*(n=4048)*	*(n=6539)*	*(n=5483)*	*(n=4924)*	*(n=4411)*
No progress	***71.4***	***73.9***	***65.8***	***71.1***	***63.8***	***70.2***
Up 1	28.6	26.1	34.1	28.9	36.2	29.8
Multiplication/Division						
Stage 3	*(n=2393)*	*(n=2546)*	*(n=2171)*	*(n=2473)*	*(n=1413)*	*(n=1615)*
No progress	***24.1***	***22.5***	***19.8***	***20.1***	***15.4***	***16.6***
Up 1	54.3	60.1	54.8	58.5	53.7	56.3
Up 2	16.7	14.3	17.9	16.9	21.7	20.4
Up 3	4.7	3.0	7.2	4.4	8.6	6.4
Up 4	0.2	0.1	0.3	0.2	0.5	0.2
Stage 4	*(n=5259)*	*(n=5330)*	*(n=5515)*	*(n=5892)*	*(n=3564)*	*(n=3991)*
No progress	***45.9***	***48.9***	***39.7***	***43.8***	***35.3***	***39.7***
Up 1	38.5	37.3	40.2	40.6	41.7	41.5
Up 2	14.1	12.9	18.4	14.6	20.5	17.4
Up 3	1.5	0.9	1.7	1.1	2.4	1.3
Stage 5	*(n=2629)*	*(n=2473)*	*(n=3621)*	*(n=3414)*	*(n=2804)*	*(n=2584)*
No progress	***48.8***	***50.0***	***41.1***	***44.7***	***37.1***	***43.5***
Up 1	42.4	42.9	49.7	48.4	51.2	46.9
Up 2	8.7	7.0	9.3	6.8	11.7	9.6
Stage 6	*(n=1458)*	*(n=1198)*	*(n=2659)*	*(n=1762)*	*(n=2136)*	*(n=1581)*
No progress	***64.3***	***72.1***	***61.8***	***64.7***	***58.9***	***64.9***
Up 1	35.7	27.9	38.2	35.3	41.1	35.1
Fractions/Ratios						
Stage 3	*(n=3063)*	*(n=2827)*	*(n=3005)*	*(n=2799)*	*(n=2012)*	*(n=1728)*
No progress	***18.7***	***19.1***	***15.9***	***14.8***	***13.5***	***12.3***
Up 1	59.7	60.7	57.6	61.1	53.2	58.6
Up 2	16.5	16.0	19.1	17.8	22.9	20.8
Up 3	4.6	4.0	6.4	5.3	8.9	7.2
Up 4	0.4	0.3	1.0	1.0	1.4	1.0
Up 5	0.0	-	0.0	0.1	0.0	-
Stage 4	*(n=5491)*	*(n=5795)*	*(n=6296)*	*(n=6781)*	*(n=4184)*	*(n=4840)*
No progress	***55.8***	***56.5***	***48.4***	***51.6***	***42.2***	***46.7***
Up 1	32.4	32.2	34.6	34.7	36.2	35.7
Up 2	10.0	9.9	13.9	11.5	17.4	14.5
Up 3	1.8	1.4	2.9	2.1	4.2	3.0
Up 4	0.1	0.0	0.1	0.1	0.0	0.1
Stage 5	*(n=2007)*	*(n=1879)*	*(n=3067)*	*(n=2753)*	*(n=2317)*	*(n=2051)*
No progress	***53.6***	***55.5***	***47.6***	***51.2***	***42.5***	***46.5***
Up 1	33.7	35.1	37.6	36.6	38.7	37.1
Up 2	12.1	8.9	13.9	11.8	17.2	15.5
Up 3	0.5	0.5	0.9	0.4	1.7	0.8
Stage 6	*(n=861)*	*(n=693)*	*(n=1567)*	*(n=1132)*	*(n=1318)*	*(n=990)*
No progress	***62.2***	***66.8***	***55.6***	***61.4***	***51.4***	***58.1***
Up 1	33.9	30.3	39.5	35.2	42.7	37.8
Up 2	3.8	2.9	4.9	3.4	5.9	4.1
Stage 7	*(n=291)*	*(n=187)*	*(n=619)*	*(n=382)*	*(n=653)*	*(n=423)*
No progress	***79.0***	***80.7***	***74.3***	***79.6***	***72.3***	***72.6***
Up 1	21.0	19.3	25.7	20.4	27.7	27.4

Appendix G

Values of Chi Squared and associated probability values for Gender Differences in Patterns of Progress

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Table G1. Value of Chi Squared and associated probability value (if significant) for Gender Differences in Patterns of Progress for ENP, ANP, and INP Projects

	2001		*2002*		*2003*	
Initial Stage	Chi Sq	Prob	Chi Sq	Prob	Chi Sq	Prob
			Addition/Subtraction			
ENP						
0. Emergent	11.45		23.67	*	29.28	**
1. 1:1 Counting	3.87		8.22		9.86	
2. Count from 1 (materials)	17.71	**	17.95	**	77.63	***
3. Count from 1 (imaging)	14.38	**	18.67	**	46.95	***
4. Advanced Counting	52.70	***	34.68	***	139.26	***
5. Early Additive P/W	7.41	**	14.52	**	52.05	***
ANP						
3. Count from one	5.52		4.77		8.41	*
4. Advanced Counting	1.46		5.96		29.30	***
5. Early Additive P/W	13.85	***	27.98	***	74.76	***
INP						
3. Count from one			3.52		3.64	
4. Advanced Counting			1.20		3.05	
5. Early Additive P/W			5.16		12.00	**
			Multiplication/Division			
ANP						
3. Count from one	3.95		12.77	*	11.37	*
4. Advanced Counting	6.20		26.06	***	57.53	***
5. Early Additive P/W	9.57	**	15.02	**	42.08	***
6. Advanced Additive P/W	6.26	*	12.57	**	32.01	***
INP						
3. Count from one			7.62		13.36	*
4. Advanced Counting			4.50		3.00	
5. Early Additive P/W			7.89		7.54	
6. Advanced Additive P/W			6.93		11.16	*
			Fractions/Ratios			
ANP						
3. Count from one	6.68		6.43		13.13	*
4. Advanced Counting	7.48		17.46	**	34.35	***
5. Early Additive P/W	4.03		22.20	***	37.32	***
6. Advanced Additive P/W	8.93	*	18.63	**	17.94	**
7. Adv Multiplicative P/W	2.03		1.15		5.48	
INP						
3. Count from one			1.36		2.22	
4. Advanced Counting			7.29		4.90	
5. Early Additive P/W			2.55		2.73	
6. Adv Additive P/W			8.17		9.89	
7. Adv Multiplicative P/W			0.99		0.64	

Statistical Significance

* $p < .05$, ** $p < .01$, *** $p < .001$

Table G2. Value of Chi Squared and associated probability value (if significant) for Gender Differences in Patterns of Progress for Years 0-8 in 2002 and 2003 as a function of Ethnicity

	European		*Māori*		*Pasifika*		*Asian*	
Initial Stage	Chi Sq	Prob	Chi Sq	Prob	Chi Sq	Prob	Chi	Prob
2002								
			Addition/Subtraction					
3. Count from one	18.24	***	9.10	*	6.70		2.45	
4. Advanced Counting	35.80	***	0.73		1.73		0.02	
5. Early Additive P/W	25.45	***	9.12	*	7.32		5.18	
			Multiplication/Division					
3. Count from one	16.60	**	4.71		4.52		3.87	
4. Advanced Counting	32.62	***	5.93		0.06		1.16	
5. Early Additive P/W	25.12	***	4.52		3.06		2.55	
6. Adv Additive P/W	10.99	*	4.10		1.34		6.22	
			Fractions/Ratios					
3. Count from one	14.91	*	4.68		3.14		1.11	
4. Advanced Counting	31.35	***	7.59		2.92		4.16	
5. Early Additive P/W	15.75	**	5.06		1.02		10.58	
6. Adv Additive P/W	18.21	**	8.54		3.95		1.50	
7. Adv Mult've P/W	2.43		1.61		0.08		2.04	
2003								
			Addition/Subtraction					
3. Count from one	66.89	***	14.81	**	12.33	**	16.02	**
4. Advanced Counting	106.92	***	6.37		0.77		1.32	
5. Early Additive P/W	70.03	***	19.27	***	2.57		8.29	*
			Multiplication/Division					
3. Count from one	40.41	***	7.18		4.71		8.54	
4. Advanced Counting	79.22	***	18.83	**	1.98		1.43	
5. Early Additive P/W	52.61	***	3.06		0.73		4.07	
6. Adv Additive P/W	26.28	***	11.44	*	0.52		12.73	**
			Fractions/Ratios					
3. Count from one	21.68	**	3.44		2.20		3.52	
4. Advanced Counting	69.66	***	9.30		4.20		4.20	
5. Early Additive P/W	27.57	***	8.56		6.07		11.49	*
6. Adv Additive P/W	20.68	**	3.59		5.17		5.01	
7. Adv Mult've P/W	7.07		1.60		1.32		0.37	

Statistical Significance

* $p < .05$

** $p < .01$

*** $p < .001$

Table G3. Value of Chi Squared and associated probability value (if significant) for Gender Differences in Patterns of Progress for Years 0-8 in 2002 and 2003 as a function of School Decile

	Low Decile		*Medium Decile*		*High Decile*	
Initial Stage	Chi Sq	Prob	Chi Sq	Prob	Chi Sq	Prob
2002						
Addition/Subtraction						
3. Count from one	11.44	*	14.61		*	14.59 **
4. Advanced Counting	3.03		12.00		**	6.44
5. Early Additive P/W	8.40	*	16.35		**	8.98 *
Multiplication/Division						
3. Count from one	17.17	**	5.93		2.90	
4. Advanced Counting	3.80		30.60	***	6.71	
5. Early Additive P/W	7.42		5.40		18.94	***
6. Advanced Additive P/W	9.18	*	0.13		11.26	*
Fractions/Ratios						
3. Count from one	5.59		7.24		8.64	
4. Advanced Counting	5.53		17.71	**	16.18	**
5. Early Additive P/W	5.60		5.44		10.38	
6. Advanced Additive P/W	6.40		14.78	*	9.32	
7. Adv Multiplicative	0.93		3.73		1.78	
2003						
Addition/Subtraction						
3. Count from one	34.77	***	33.43	***	49.45	***
4. Advanced Counting	22.78	***	39.68	***	45.37	***
5. Early Additive P/W	11.95	**	42.21	***	44.81	***
Multiplication/Division						
3. Count from one	23.71	***	21.42	***	9.24	
4. Advanced Counting	17.27	**	45.97	***	33.29	***
5. Early Additive P/W	7.36		24.11	***	27.39	***
6. Advanced Additive P/W	19.29	***	3.85		14.79	**
Fractions/Ratios						
3. Count from one	3.30		9.02		13.11	*
4. Advanced Counting	5.98		29.98	***	30.96	***
5. Early Additive P/W	10.90		16.82	**	13.61	*
6. Advanced Additive P/W	7.03		10.60		15.70	**
7. Adv Multiplicative P/W	2.27		6.41		2.60	

Statistical Significance

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: The values of Chi Squared in the preceding tables range from non-significant (no asterisks) to statistically significant at the .001 level. Although the tables may show an apparent difference between Boys and Girls, if there is no asterisk, this difference is not statistically significant (probably because the differences *within* each of the two groups are greater than the differences *between* the two groups). One asterisk means that the probability that the difference between Boys and Girls is due to chance is less than 5 in 100 or 1 in 20, meaning that there probably is a real difference between the two groups (however, for every 20 analyses yielding a significant difference at the .05 level, we will be wrong once). Two asterisks mean that we can have greater confidence in the difference because the probability that this is a chance difference and not a real difference is less than 1 in 100. Three asterisks means we can be very confident that this is a real difference between the two groups because the probability of a chance difference is less than 1 in 1000.