MINISTRY OF EDUCATION NEW ZEALAND
Te Tāhuhu o te Mātauranga Aotearoa

Evaluation of Literacy and Mathematics Additional Learning Programmes for Students 2011

Report to the Ministry of Education

Bronwen Cowie, Clive McGee,
Mira Peter, Merilyn Taylor & Junjun Chen

newzealand.govt.nz

Research & Evaluation

ISBN: 978-0-478-40601-6

ISBN: 978-0-478-40602-3 (web)

RMR-1012

Research reports are available on the Ministry of Education's website Education Counts: www.educationcounts.govt.nz/publications.

EVALUATION OF LITERACY AND MATHEMATICS ADDITIONAL LEARNING PROGRAMMES FOR STUDENTS 2011

Final Report

Report Commissioned by
Ministry of Education

Bronwen Cowie, Clive McGee, Mira Peter,
Merilyn Taylor & Junjun Chen

With

Tracey Carlyon, Ariana Donaghy, Anthony Fisher, Richard Hill,
Ngārewa Hāwera, Sashi Sharma, Jenny Young-Loveridge

The University of Waikato
Private Bag 3105
Hamilton 3240, New Zealand
www.waikato.ac.nz

Wilf Malcolm Institute of Educational Research (WMIER)
Faculty of Education

Telephone: (07) 858 5171
Fax: (07) 838 4712
Email wmier@waikato.ac.nz

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

Table of Contents

Tables

Appendices Figures

Appendices Tables

Executive Summary

Introduction

This research report outlines the findings of an evaluation of the *Literacy and Mathematics: Programmes for Students 2011*, a Ministry of Education initiative to provide additional teacher time to enable selected schools to organise programmes for students who were assessed as 'below' or 'well below' the National Standards in mathematics, reading or writing. This initiative allowed a primary or intermediate school to design programmes in mathematics, reading or writing for a group of students to work intensively with a selected teacher.

The focus of this evaluation was to investigate the impacts of these programmes upon student achievement (and to look particularly at Māori and Pasifika student achievement) teaching approaches and how the programmes influenced school-wide teaching and learning. The evaluation was from June to December 2011 and, during the project, researchers and Ministry research and curriculum personnel worked together to shape the evaluation.

The programmes

The 2011 literacy and mathematics programmes for students were:

1. Reading in Year 1: Shared book/language experience to supplement guided reading for students at risk of not achieving National Standards after one year at school.
2. Reading in Year 2: Intensive and responsive teaching of reading for students at risk of not achieving the National Standards in reading.
3. Writing in Years 4 to 8 for students who were 'below' or 'well below' National Standards in writing.
4. Reading and writing for English language learners.
5. Mathematics for Years 3 to 8 students who were 'below' or 'well below' National Standards (Accelerating Achievement in Mathematics – ALiM).
6. Mathematics for Years 3 to 8 students who were 'below' or 'well below' National Standards and were taught by Specialist Mathematics Teachers (SMT).

Schools selected the programme related to the area of focus for their students. Some schools took part in more than one programme. The first five programmes were taught for 10 weeks and the SMT programme was taught for 15 weeks.

The main aim of the programmes was to accelerate learning for a small group of students who were judged as 'below' or 'well below' National Standards. Accelerated learning was defined as occurring when the amount of a student's learning in reading, writing or mathematics increased by more than the amount expected in the equivalent time in the regular classroom programme. That is, if reading, writing and ALiM (maths) 10-week programmes (or the SMT maths programme of 15 weeks) resulted in greater progress than would be expected, learning was assessed as accelerated.

Participating schools

Schools were selected by regional Ministry of Education offices, with input from mathematics facilitators, literacy advisors and professional learning development (PLD) providers. Priority was given to schools with high percentages of Māori, Pasifika or English for speakers of other languages (ESOL) students who were achieving below expectations. Schools selected for the programmes were expected to have:

- effective classroom teaching and learning occurring
- students identified as operating 'below' or 'well below' National Standards
- school leadership actively supporting teacher learning and innovation
- effective classroom teachers.

Within the schools principals were asked to select teachers for their expertise in working with low achieving students and for their willingness and ability to respond to student learning needs

Students who were 'below' or 'well below' National Standards were selected for the programmes. Consideration was also given to the likelihood the student would benefit from the intensive programme and from working in a small group. Other selection criteria applied by schools included regular attendance and ability to work in a group.

Programmes were run throughout 2011. Planning meetings were held prior to the start of the programmes by the Ministry of Education to brief teachers and principals on the intentions of the programmes.

Evaluation methodology

The evaluation sought to determine the extent to which student learning was 'accelerated' as a result of their participation in the programmes and what pedagogical practices had contributed to any gains.

The research questions for the evaluation were:

1. To what extent have the programmes in reading, writing, mathematics and English language learning accelerated learning for programme students?
2. To what extent have the programmes accelerated learning specifically by Māori, Pasifika and students with special learning needs?
3. What factors contributed to the success of programmes in terms of student achievement and teaching approaches?
4. How responsive to the needs of students was the teaching, including any differences across the targeted groups?
5. How well did teachers of the different programmes design and deliver learning plans to students?
6. To what extent did a more responsive pedagogical approach better meet the needs of students and did teachers change their usual teaching practices during the programmes?
7. Have reading, writing and mathematics programmes been influenced by other current or recent Ministry activities?

Data collection

A mixed methods approach to data collection was used. Data sources were: online surveys, student achievement data, interviews and case studies.

Data were sought for this evaluation from all schools involved in programmes during Term 3 2011 (n=240 schools: 94 involved in literacy programmes, 146 in mathematics).

- **Principals and teachers**: Online surveys were emailed to principals and teachers at the start and at the end of the programmes.
- **Students**: Online attitude surveys were completed with students at the start and at the end of the programme.
- **Case study schools**: There were 25 case study schools, among these: 11 had mathematics programmes (nine ALiM and two SMT schools); 15 schools had literacy programmes: four had Year 1 reading; five had Year 2 reading; seven had writing in Years 4-8, and there was one English Language Learning school.

Student achievement data: collected pre and post programme

- Mathematics: Progressive Achievement Test (PAT): Mathematics test at the appropriate level and Numeracy Project Assessment – Diagnostic Interview (NumPA)
- Reading: Observation Survey, instructional text reading levels and Overall Teacher Judgement (OTJ)
- Writing: asTTle writing and Overall Teacher Judgement.

Data were analysed for the students in the study and three ethnic groups of students—New Zealand European, Māori and Pasifika. Reading data were submitted by 52 per cent of schools (122 students). Writing data were submitted by 63 per cent of schools (320 students). For ALiM maths schools, PAT data was available for 559 students and 642 students for NumPA. For SMT maths schools, PAT data was available for 252 students and Numpa data for 371 students.

Measuring student progress from short-term interventions is complex and challenging, particularly when using the assessment tools currently available. In this evaluation a variety of measures were used to estimate whether progress for students was accelerated. In some cases the sample sizes are small and some findings, particularly for the ethnic groups, should be considered as indicative only. Further work is needed to develop better measures of progress and acceleration in short-term interventions.

Evaluation findings

Key findings

1. The majority of mathematics, reading and writing students accelerated their learning during the programmes, that is, their achievement increased more in the programmes than would be expected in the equivalent classroom time. In reading, nearly two-thirds of the students improved in relation to the National Standards. In writing, students, on average, improved by at least one level on the asTTle test. In the ALiM maths programme the majority of students gained at least one framework stage over the 10 weeks.
2. Māori, Pasifika and New Zealand European student groups increased their learning in reading and writing. In mathematics, Māori students recorded a significantly higher increase in the scale score than the other two groups for PAT, and Pasifika students recorded the greatest stage increase across all the Numeracy Framework domains.
3. Key elements in the organisation of the programmes were identified and should inform future programmes, eg, small groups, targeted teaching, sessions longer than 30 minutes, at least four lessons a week, responsive teaching, planning and reflection, focus on and use of data.

4. Teacher reflection, planning and preparation was iterative and adaptive to respond to student learning as it evolved. These factors were linked to increases in student achievement in reading, writing and mathematics.
5. Leadership from principals was essential to the programme. Principals played an important role in ensuring there was support for the programme teacher, commitment to the programme and for spreading positive programme outcomes more widely in the school during the programme and beyond it.
6. Principals and programme teachers of the mathematics, reading and writing had high expectations that they would accelerate the learning of most programme students.
7. The small group design of the programmes fostered and enabled safe and more frequent interaction amongst students and with the teacher.
8. Ministry planning and follow-up days for teachers played an important role in setting expectations and accountability for the programmes, disseminating successful outcomes and initiating a community of interest focused around raising the achievement of students who were achieving 'below' or 'well below' expectations.

School organisation for the programmes

In schools there were two main organisational forms or models developed for the programmes; either groups were withdrawn to a separate space or groups were taught in the classroom. The particular teaching arrangements varied; the teacher of the intervention was sometimes the students' regular teacher and sometimes not. In some schools, more than one teacher was involved in the programme. This was more likely to be the case in the literacy schools.

Programmes were organised and run differently across the schools. In maths, three-quarters of the SMT and ALiM programmes were taught four or five times a week. Half of the SMT teachers ran lessons of more that 30 minutes and three-quarters of ALiM teachers' lessons were 30 minutes or more. Over 80 per cent of the reading programmes and 79 per cent of writing programmes had at least four or five lessons per week; 62 per cent of the writing lessons and 35 per cent of the reading lessons were over 30 minutes in duration and half the reading teachers ran 16-30 minute lessons.

It appeared that frequent teaching in lessons over 30 minutes was linked to improved learning outcomes because students could engage in clearly linked, cumulative and focused learning activities over a longer time.

Student achievement

A key aspect of this evaluation was to measure the extent to which the programmes in reading, writing, and mathematics accelerated learning for all students and for Māori and Pasifika students. Data were analysed for the whole student group and three ethnic groups of students—New Zealand European, Māori and Pasifika. Group means showed that all three ethnic groups had comparable levels of achievement change on the various assessment measures for reading, writing, and mathematics.

Reading and writing

The results showed that overall, students achievement in reading and writing improved and this was accelerated. Māori, Pasifika and New Zealand European students all made accelerated progress in terms of group mean scores, that is, they made more progress than they usually would have in the same time.

Reading

In reading, student achievement data were gathered using the Observation Survey, Running Records and an Overall Teacher Judgement against the National Standard.

At the beginning of the programmes almost all reading students (92 out of 95) were rated 'well below' or 'below' the National Standard for reading. At the end of the programmes nearly two-thirds of the ratings teachers gave students from the three ethnic groups improved in relation to the National Standard, eg, improved from 'well below' to 'below' or 'below' to 'at'. At the end of the programmes over a third (n=27) of students were rated 'at' or 'above' the National Standard.

Sixty-one per cent of Year 1 and 68 per cent of Year 2 students improved by two or more colour levels on the *Ready to Read* colour wheel indicating accelerated learning in the 10-week programmes.

Writing

In writing, pre and post student achievement data was collected using asTTle writing and Overall Teacher Judgement. Analysis of achievement scores showed that the majority of students accelerated their learning over the programmes.

At the end of the programmes, writing achievement of New Zealand European, Māori, Pasifika students improved, on average, by at least one level on the asTTle test.

At the beginning of the programmes almost all students were rated 'well below' or 'below' the National Standard for writing. At the end over half of the programme teachers' ratings of the students in relation to the National Standard had improved eg, ratings had improved from 'well below' to 'below' or 'below' to 'at'.

Mathematics

In mathematics progress and acceleration for student achievement data was assessed using PAT scale scores and changes in group means in the Numeracy Framework domains using NumPA. Overall, across the measures the change in group means were such that student learning can be considered accelerated.

In ALiM and SMT, the PAT scale score and percentage yearly growth group means for the whole group and each of the Māori, Pasifika and New Zealand European groups significantly increased from pre to post programme.

NumPA results showed a significant increase in group means in all domains for both ALiM and SMT from pre to post assessment. The majority of students made a gain of at least one framework stage over the 10 weeks of the ALiM programmes. This compares with the findings from the Numeracy Development Project (Young-Loveridge 2010) where students at stages 4 or 5 would be likely to move a stage in a year. For SMT participants, growth over the 15-week programme was similar to what would be expected for 27 weeks.

Students who began the programmes at a lower stage of the Number Framework tended to make more progress, on average, than those who started at higher stages. This might be expected as steps at the lower stages are smaller and easier to progress through.

The effect sizes for Māori and Pasifika students were higher than that for New Zealand European students. Pasifika students recorded the greatest stage change growth across all domains in the Numeracy Framework.

The PAT data showed all three ethnic groups made significant gains in PAT scores from beginning to end of the programmes. The average change for each group was comparable and progress was similar, irrespective of starting point across the three ethnicities. Year 4 students showed the average greatest growth in PAT scale score, suggesting the programme may be of particular value to this group.

In the SMT programme, the Year 4 students showed the greatest change as measured in average scale score in PAT mathematics scale score. Growth over the 15-week programme was similar to what would be expected for 27 weeks.

To get an estimate of progress for students participating in ALiM compared to their progress prior to ALiM, PAT data was collected from a small number of schools. Student progress over Terms 1 and 2 was compared to progress over the ALiM programme (Term 3). Data from the 32 students showed significantly greater increases in PAT scale scores over the ALiM programme compared to progress in the two terms prior to the programme. While the results should be interpreted cautiously because of the small numbers, they suggest the programmes did accelerate students' learning at a greater rate than previously.

Māori students

On all of the test and assessment measures Māori students as a group made accelerated progress at a similar rate to Pasifika and New Zealand European students in the reading, writing, and ALiM and SMT mathematics programmes.

In ALiM, the effect sizes for PAT measures for Māori and Pasifika students were comparable, and greater than for the New Zealand European student group. The ALiM Māori student group recorded the highest movement in PAT scale score mean and experienced significantly greater progress than New Zealand European students (not Pasifika) when calculated by percentage of usual yearly growth.

Pasifika students

On all of the assessment measures Pasifika students as a group made accelerated progress in reading, writing, ALiM and SMT programmes. Half of the Pasifika students reached the expected reading level on the National Standard, although the sample was small. Teachers also judged Pasifika students to have improved in relation to the National Standard in writing, eg, ratings increased from ‘well below’ to ‘below’ and for some from ‘well below’ to ‘at’ the National Standard. Pasifika students recorded the greatest stage change growth across all the domains of the Numeracy Framework.

New Zealand European students

The New Zealand European students as a group accelerated their learning on all of the assessment average change measures.

Programme design elements

These literacy and mathematics achievement results show that, on average, students had accelerated their learning in reading, writing and mathematics by the end of the programmes. The results are consistent with: high expectations and accountability, planning and commitment from those involved, responsiveness, support and reflection time. The programme elements are discussed below.

Planning, reflection, expectations and commitment

The results from the achievement data are consistent with high expectations that principals and teachers had before the programmes began with, that student learning would increase more than it usually would in the equivalent time. Principals and teachers across the schools made a strong commitment to improve student learning. This commitment appeared to come from the way the programmes were set up at the national level through the provision of teacher time for planning and briefing; time for preparation, teaching and reflection; and pre and follow-up sharing of teaching and learning outcomes and an expectation to report back on progress. There was a sense that schools as a whole made a

commitment to make the programmes work and to embed positive influences into the programme teacher's own ongoing teaching and across the school.

Programme teachers planned their programmes and kept regular records of day-to-day modifications to plans. Ongoing reflection on formative assessment information informed iterative cycles of responsive planning. Information on student ideas and responses, especially formative assessment, were often shared with a student's regular teacher, with lead teachers in reading, in particular, playing an active role in fostering this communication, as well as helping teachers to refine their practice.

The daily planning and preparation was important to be able to be flexible, responsive and react to the learning that had gone before. Teacher and principal surveys conducted at the end of the programmes reported that students had made more or much more progress than usual. Maths teachers felt gains made during the programmes would be sustained, if at a lesser rate.

Support for teachers

Principals were expected to provide support for the programme teachers and they played a key role in organising satisfactory spaces, resources, scheduling and ensuring there was colleague support for planning and teaching.

In many schools the programmes were seen as a collective responsibility. The allocation of teacher time and the expectation to report back after the end of the programmes combined with commitment and enthusiasm to work to make the programmes successful for the students. Teachers and principals also mentioned the benefits for themselves and the schools in taking part in the programmes, such as adaptations to practice and use of data.

Within the reading and writing programme, another teacher (lead teacher, syndicate leader) frequently acted as a colleague in support or 'critical friend', especially for less experienced teachers. Reading and writing teachers found the most useful support came from the lead literacy teacher as a mentor, literacy advisors and Reading Recovery teachers. Mathematics teachers were provided with professional support from an external facilitator as part of the ALiM and SMT programmes. On the whole, maths teachers found the facilitators to be supportive, to be able to suggest new ideas and provide guidance. Teachers felt collegial support was also a contributor to the success of the programmes.

Strong principal leadership in terms of priority and organisation within the school was important to the success of the programmes. Most principals had high expectations for the programmes and this seemed to create a sense of urgency in teachers to raise student achievement. Most principals also initiated processes to extend any benefits from the programmes to other teachers in a school and many programme teachers were required to share their experiences, especially with the regular teachers of the programme students.

Culturally responsive teaching

How teachers taught was of major importance in this evaluation. Strong encouragement was given to teachers in planning days prior to the programmes to use teaching that was *responsive to students' needs* and in particular to practice *culturally responsive pedagogy*. Teachers were given background information and presentations on effective and responsive teaching. Pre-programme survey data showed that most teachers were able to describe aspects of their classroom teaching that were effective and responsive to students' cultural/ethnic characteristics and background. In general, they cited high expectations of students, knowledge of each student and a classroom where all students were included and valued. In post surveys, teachers cited changes they made to their general teaching for different students, such as tailoring the topics of lessons to student interest and catering for particular learning preferences.

Post-survey teacher data and teacher interviews showed that teachers, in general, used their usual teaching approaches but made specific adaptations for individual students based on the students' particular learning needs. Providing focused, individualised attention that was planned and adapted for students was likely to have been different from the daily classroom practice with a larger group of students.

Teachers themselves had mixed views about how they changed their teaching approach to better suit the Māori and Pasifika students in their groups. Teachers reported that they tended to teach all students in the group in a similar way to their usual classroom teaching because there are certain teaching approaches they know to be effective. On the other hand, teachers reported how they had changed specific approaches to suit Māori and Pasifika students, such as choice of reading books, letting each child choose writing topics that interested them and greater use of games and discussion about mathematical ideas. Teachers reported the importance of getting to know all programme students quickly and responding to what students were learning.

ALiM teachers found use of materials and equipment, a variety of approaches, discussion with peers, forming relationships and structured programmes were effective teaching approaches for these students. SMT teachers found working in small groups, modelling, using equipment and encouraging student talk to be effective strategies with their groups of students.

Family/whānau involvement

Most school plans for implementing the programmes emphasised the importance of family/whānau involvement. Almost all principals and teachers reported informing parents of the programme and many invited parents to visit schools to observe lessons and some ran group information sessions. Over the whole group, a large majority of teachers believed that parents and family/whānau were supportive of the programmes and in case study schools only a small minority of parents did not engage when invited to, such as help learning at home. It was not possible to measure the impact upon learning of parental support; however, almost all teachers interviewed in case study schools believed student achievement and attitudes were helped by family/whānau involvement and support.

Actual parental involvement varied across the schools. It was common for schools to advise the whānau/family the student was part of the programme, for activities to be sent home and to invite whānau/family to evenings or to view lessons, to varying degrees of success.

In the interviews and the surveys ALiM and SMT teachers identified support from home as a factor contributing to the success of the programmes.

Student experiences of the programmes

Overall, students enjoyed their time on the programmes and in some cases could identify activities that had helped their learning. In the post-programme surveys, nearly all students reported positive learning experiences in the programmes. Many, even the younger readers, could identify learning activities that helped their reading, writing or mathematics. Students reported enjoyment of the small group setting owing to fewer distractions. Students felt special to be part of the group and grew more confident. The student surveys showed positive changes in attitudes from the start to the end of the programmes as confidence, motivation, and engagement increased.

Mathematics students said they played more interactive mathematical games, used more materials and artefacts and had more discussions with peers. They thought they had gained confidence and motivation and had learned better than in their usual classroom; and they rated themselves as better at mathematics by the end of the programme. Many literacy students were able to identify particular strategies and learning skills that had been emphasised and to explain how they helped their reading or writing. The strategies and skills were not usually new; rather, they were given more emphasis

in the group setting, such as systematically building vocabulary for use in writing. There was evidence from students that the changes the teachers made had helped their learning. Many reading students gave examples of learning improvements, like writing more interesting stories, being able to read higher-level books or understanding mathematical concepts and patterns.

ALiM and SMT teachers reported shifts in students' enjoyment, motivation and engagement over the duration of the programmes. Students reported increasing their enjoyment of the subjects and gaining confidence while on the programmes.

Sustainability

Principals who took part in data collection were convinced about the value of the programmes and many were looking for ways to spread the positive outcomes from the programmes school-wide. All principals' case study schools had either already begun to widen the impact across a part or all of the school or had plans to achieve a wider impact in the school in future. Principals and teachers saw advantages to the programme teacher being a regular member of staff and the classroom teacher of students in the programme. This was owing to existing relationships between students and teachers and the ability to capitalise on programme gains in the classroom more easily.

Many schools began to widen the reach of the programmes for sustainability by linking the programme teacher to other teachers. Programme teachers reported sharing their learning across the school, with many intending to formalise these processes. Teachers saw the knowledge and experience of working with the group as a valuable learning experience and many were taking approaches applied during the programmes to inform practice in their classrooms.

Staff meetings and teacher syndicates were being used as vehicles for influencing other teachers across the school in terms of changing classroom teaching to help students who were below learning expectations. Nearly all ALiM and SMT teachers shared learning and effective teaching practices with other teachers in their schools. Principals of ALiM and SMT teachers felt programme teacher sharing had positively influenced other teachers and students in their schools.

Elements of successful programmes

There was evidence that teachers were practising elements of culturally responsive pedagogy from teachers' self-report of their approaches and their plans for teaching and student feedback. We could not demonstrate causal links between responsive teaching and student achievement or rank the importance of particular teaching approaches. However, there were indicators that some teaching approaches and elements of the programme model were very important in improving student achievement, including the target groups of Māori and Pasifika. These successful approaches were:

- systematic, detailed and responsive daily and weekly teacher planning
- support, commitment and leadership from the principal
- regular, uninterrupted small-group teaching of at least four lessons per week
- lessons that were more than 30 minutes
- focus on the specific learning skills and concepts required to learn to read and/or write and to learn mathematics
- focus on specific curriculum content at a suitable learning level

- effective and responsive teacher
- regular assessment, feedback to students, planning and record keeping
- teacher and principal enthusiasm and high expectations
- family/whānau participation in helping children's learning
- learning activities that capture student interest, make learning enjoyable and extend their learning
- regular reflection of their own teaching by programme teachers.

Of the above, the crucial factors appear to be detailed planning, lesson length of at least 30 minutes and frequent lessons, focus on particular curriculum content (but no pressure to cover a prescribed amount) detailed and regular feedback to students and teacher expectation and enthusiasm.

More broadly, teachers who were supported were more effective in implementing these successful approaches. Principals needed to be involved in teacher and student selection, support and resources for the teacher. They needed to organise active collegial planning of the programme and arrange the sharing of programme experiences with a student's regular teacher.

With the above factors in place, Māori and Pasifika students experienced success in the programmes and their learning was accelerated. The students were generally positive about the extra help they received and their achievement scores indicated that, on the whole, their learning had benefited. Changes in students' attitudes were consistent with the accelerated learning achieved by the majority.

In summary, the above factors interacted and together constituted effective and responsive teaching.

Concluding comment

This evaluation provides evidence that the additional learning programmes for groups of primary students in mathematics, reading and writing resulted in accelerated learning for the majority of the programme students not achieving National Standards at the start of the programmes.

School principals and teachers demonstrated a sense of accountability to succeed in raising student achievement. They saw benefits in a model that set out a clear goal and parameters for the programmes.

At the school level, principals and teachers worked within the parameters and resources of the programmes to use their own initiative and expertise to promote student learning and meet national level expectations. Principals and teachers relished working within the high trust model and were empowered when they saw gains in student motivation, engagement and achievement. Programme teachers were keen to share what they had learned with colleagues, who responded positively to local evidence of the progress students could make. Programme students were positive about their experiences, reporting they had valued participating in the programmes and that their learning had benefited. Finally, school leaders saw the need to widen the positive effects of the programme of teaching and learning to other teachers and students across a school and many had already introduced processes to pursue this goal beyond the programme itself.

Overall, looking at the student achievement data and the teacher, principal and student surveys, the reading, writing and mathematics programmes were effective at raising student achievement for students not achieving National Standards. The surveys, case studies and interview also provide evidence for changes in students' attitudes and changes to teachers' practice.

The picture for the literacy programmes is less conclusive than for mathematics owing to the smaller sample of consistent student achievement data available for analysis. However, for both writing and reading, on average, students made progress on the measures provided. Principal, teacher and student surveys and case study feedback suggest these programmes were also effective in raising student achievement for students not achieving National Standards.

1 Introduction

This research report outlines the results of an evaluation of additional learning programmes in reading, writing and mathematics in 240 primary schools in 2011. The focus of the research was an evaluation of the impacts of additional resources provided by the Ministry to enable selected schools to arrange additional teaching time for a small group of students who were assessed as 'below' or 'well below' the National Standards for reading or writing or mathematics. The evaluated programmes were taught in Term 3, 2011 (10 weeks) except for a programme in mathematics that also included teaching time in Term 4 (15 weeks in total). For the evaluation, student achievement results were collected and analysed. Data were also collected from school principals, programme teachers and their students through online surveys and interviews in a sub-sample of case study schools. Evidence across these data sets indicated that, on average, student learning was accelerated in reading, writing and mathematics. That is, students made more progress than would have been expected in a regular classroom programme in the same period.

As part of the Education (National Standards) Amendment Act 2008 National Standards were established in literacy (reading and writing) and mathematics and every primary and intermediate student would be assessed regularly against these National Standards. The stated goal of this policy is to improve the literacy and numeracy achievement of all students. As part of this policy, the Ministry has supported schools with additional learning programmes specifically targeted at students who were not achieving the National Standards. The policy document *Literacy and mathematics: Interventions investment 2011* outlines for Ministry of Education regional offices the intentions and design of the Additional Learning Programmes. There were three tiers of Ministry of Education support. Tier 2 and Tier 3 provided intensive classroom support in literacy (reading and writing) and mathematics (Tier 2) and specialist support in mathematics (Tier 3). In this report the additional learning programmes are referred to as programmes. Regional offices chose schools to participate. Principals and programme teachers attended training and planning days that were funded by the Ministry of Education. During the two-day seminar the teachers and principals were briefed on the expectations for programmes and facilitators helped them interact with other teachers to clarify their plans for the teaching approaches they would use with their additional learning children. Members of the research team attended some of these days to learn more about the context of the interventions and to get information that would be important in the construction of data collection tools for the evaluation of the programmes.

Several underlying themes relevant to both literacy and mathematics were emphasised by the presenters of the professional learning. They included: 1) a sense of urgency about the need to accelerate learning and change student outcomes for those students who are 'below' or 'well below' National Standards 2) teachers and principals are trained professionals who are best placed to link learning needs of students to teaching approaches 3) teachers were encouraged to engage in culturally responsive pedagogy, responsive to children's daily lives and to pay particular attention to Māori and Pasifika students 4) encouragement to teachers to use established effective teaching approaches but to be also willing to modify their teaching to suit their specific group of learners 5) the need for collaboration within and outside of a school—to value and seek out expertise and resources as they needed them and to consider involving the children's families in the learning programme. In the case of the ALiM and SMT programmes the teachers were provided with the 'Effective Pedagogy in Mathematics' summary booklet (Anthony & Walshaw, 2009). The teachers reviewed the ten principles in small groups.

Literacy Reading and Writing Programmes

Reading and writing programmes intended to accelerate learning were added as a pilot in four streams or categories in 2011:

1. Reading in Year 1: shared book/language experience to supplement guided reading for students at risk of not achieving National Standards after one year at school.
2. Students in Year 2 at risk of not achieving the National Standards in reading.
3. Writing in Years 4 to 8 for students who were 'below' or 'well below' National Standards in writing.
4. Accelerating progress towards National Standards in reading and writing for English language learners (ELL) for whom English is their second language, and students moving from Māori-medium to English-medium teaching.

This research focused on the first three categories, with some attention to a very small sample of ELL. No students were identified who had transferred from kura to mainstream classrooms. Ministry resourcing provided 15 days of teacher release to plan and teach a programme and attend regional planning and follow-up days.

ALiM and SMT mathematics programmes

The 2011 ALiM and SMT mathematics programmes built on from a programme called Accelerating Learning in Mathematics Pilot Study (ALiM), which was funded by the Ministry of Education and involved 39 schools. In 2010 children who were low achieving were taught intensively, in small groups, for 10-15 weeks. The ALiM project was evaluated as successful by New Zealand Council for Educational Research (NZCER) (Neill, Fisher, & Dingle, 2010) with a greater positive impact for Pasifika than New Zealand European and Māori students. In 2011 a further round of interventions in mathematics was planned and implemented in Terms 2 and 3. The evaluation of this programme reported similar gains to those found in 2010 but with no differential impact for Pasifika students (McGee & Peter, 2011). A second programme, the Specialist Mathematics Teacher (SMT) programme was introduced and taught to a separate group of students for 15 weeks in Terms 3 and 4. This report focuses on the Term 3/4 ALiM and SMT programmes.

The ALiM programme was targeted to students with learning needs where a short-term boost/acceleration of learning would support them to attain the expected National Standard level. The goal was to accelerate their learning as fast as possible to the expected level. It was anticipated that a significant number of Māori and Pasifika students would be part of the project. Schools were nominated and invited to participate in the ALiM programme. The criteria for nomination/selection were that the school would be one where good classroom teaching was occurring and with no major issues that were likely to negatively impact programme implementation. It was expected that a majority of schools might be of a lower decile. Schools were advised to select an effective classroom teacher with a good understanding of mathematics pedagogy and cultural responsiveness to work with a small group of students who were achieving 'below' National Standards in relation to their peers. As well as quality and effective classroom teaching, the 5 to 12 students involved were expected to receive 20-40 minutes additional instruction per day 3-5 days per week over 8-10 weeks. Schools were given 15 days teacher release for the ALiM programme. This release included time for one teacher to work with students, to attend programme planning days, plan, prepare and reflect on lessons, to write a reflective summary of their programme and to attend a final Expo day to share what had been achieved and learned. ALiM schools were provided with 20 hours of external support.

The SMT (Specialist Mathematics Teachers) programme was targeted at students who were achieving 'well below' in relation to the National Standards and who had been identified as having learning needs that require longer-term support or interaction with a teacher who had specialist knowledge and expertise. SMT schools were advised to select a

highly effective, culturally responsive mathematics teacher, with proven ability to accelerate learning. Schools were provided with teacher release of approximately 0.5 FTE for 15 weeks. It was noted that teachers who had been involved in ALiM previously might be suitable, as would be ex-facilitators of numeracy and/or excellent lead teachers. It was suggested that a significant number of Māori and Pasifika students would be part of the project and the schools would likely be lower decile, although this would not necessarily be the case. Specialist Mathematics Teachers were provided with 40 hours of external support per school.

Information about pedagogy

The training and planning days run by the Ministry of Education prior to the programmes included presentations on approaches to teaching Māori and Pasifika students, as well as teaching students generally. Teachers were advised to alter their teaching approaches and/or use approaches that they knew to be effective. Teachers were reminded that Māori and Pasifika students are over-represented in the ratio of students whose achievement is 'below' or 'well below' expected levels. There were presentations about culturally responsive pedagogy.

In recent years in New Zealand increasing importance has been placed on culturally responsive pedagogy in response to the increasing cultural diversity of the school population and concerns about Māori and Pasifika achievement (Hill & Hawke, 2000; Carpenter, McMurchy-Pilkington, & Sutherland, 2002). On the basis of extensive classroom research and teacher development, Bishop and colleagues have developed a model of six sets of teaching characteristics that represent culturally responsive pedagogy with Māori students (Bishop, 2012, pp. 198–99). The characteristics for teachers are:

- manaakitanga: Teachers care for the students as culturally located human beings above all else
- mana motuhake: They care for the performance of their students
- whakapiringatanga: They are able to create a secure, well managed learning environment by incorporating routine pedagogical knowledge with pedagogical imagination
- wananga: They are able to engage in effective teaching interactions with Māori students as Māori
- ako: They can use strategies that promote effective teaching interactions and relationships with their learners
- kotahitanga: They promote, monitor and reflect on outcomes that in turn lead to improvements in educational achievement for Māori students.

Recent policy documents encapsulate the principles of culturally responsive pedagogy: The *New Zealand Curriculum* (Ministry of Education, 2007), *Te Marautanga* (Ministry of Education, 2008), and *Ka Hikitia, Tataiako* (Ministry of Education, 2008) outline approaches that teachers can use with Māori students. These approaches, called cultural competencies for teachers, are related to registered teacher criteria. The importance of teachers taking account of a student's culture is outlined in Bishop and Glynn (1999).

There is a degree of generality in these characteristics and analysing whether teachers' actual teaching demonstrates them is difficult. It can be argued that these characteristics and competencies apply to all students, with adaptations for the particular culture of each student. Bishop agrees with this view (personal communication, March, 2012). More specification can be found in numerous descriptions of effective teaching (eg, Alton-Lee, 2003). Nevertheless, the importance of Bishop's work (Bishop, 2012) is that he has added the word 'relations' to culturally responsive pedagogy to emphasise the key role of teacher-student interactions in the teaching of Māori students. He argues that teachers should share more of the decision-making about learning with Māori students to let them take more 'ownership' and interest in their learning, especially since too many Māori students have not found school a positive experience. The same comment could be made about other student groups.

2 The Evaluation Design

The evaluation was designed to gauge the extent that the programmes accelerated students' reading, writing and mathematics learning. At the planning days teachers were urged to track student learning gains, with careful attention to how these might vary between different groups of students—particularly Māori and Pasifika. Teachers were briefed on the data that would be useful to collect such as before and after test scores and work samples. Teacher data included a 'reflective journal' (mathematics teachers) and ongoing notes (reading and writing teachers) covering plans, teaching approaches and student learning and attitudes. Thus teachers were encouraged to understand what might have contributed to any improvements in student achievement and to keep ongoing records of their own teaching and student change.

Research questions

The evaluation sought to determine the extent to which student learning was 'accelerated' as a result of their participation in the programmes and what pedagogical practices had contributed to any gains. The research questions for the evaluation were:

1. To what extent have the programmes in reading, writing, mathematics and English language learning accelerated learning for programme students?
2. To what extent have the programmes accelerated learning specifically by Māori, Pasifika and students with special learning needs?
3. What factors contributed to the success of programmes in terms of student achievement and teaching approaches?
4. How responsive to the needs of students was the teaching, including any differences across the targeted groups?
5. How well did teachers of the different programmes design and deliver learning plans to students?
6. To what extent did a more responsive pedagogical approach better meet the needs of students and did teachers change their usual teaching practices during the programmes?
7. Have reading, writing and mathematics programmes been influenced by other current or recent Ministry activities?

2.1 The sample and sampling process

Data were sought from all schools (n=240 schools: 94 involved in literacy programmes, 146 in mathematics) on the Ministry of Education database. Note: Some schools were involved in more than one programme.

Principals and teachers: All programme school principals and teachers were asked to answer an online survey at the start and at the end of the intervention.

Students: Teachers in all schools were asked to manage and help students complete student online surveys at the start and at the end of the intervention. It was anticipated that younger (and perhaps some older) students might need teacher assistance in understanding the wording of questions and a scale for responses.

A sub-sample of case study schools: Twenty-five schools were chosen for greater indepth investigation via school-based interviews. These were identified in discussion between Ministry personnel and the research team. The schools in this sample were selected to reflect the following criteria: a high proportion of Māori and/or Pasifika students in a number of the programme groups, schools from a range of deciles (weighted to low deciles) and schools that were perceived to be able to change student achievement. Schools were chosen from Northland, Auckland, Waikato, Bay of Plenty, Wellington and upper South Island regions for practicality of visiting. The Ministry identified a number of schools that were involved in both mathematics and reading or writing interventions, which has enabled greater coverage.

Some of the 25 schools had more than one programme. Eleven schools had mathematics programmes (nine ALiM and two SMT schools); 15 schools had literacy programmes: four had Year 1 reading; five had Year 2 reading; seven had writing in Years 4-8 and there was one ELL school. It should be noted that the sub-sample is not representative of the whole intervention school population. Rather, it has been managed to reflect the above criteria and to provide the opportunity to address the evaluation questions.

2.2 Data collection

A mixed methods approach to data collection was used. Data sources were: online surveys, student achievement data, interviews and documents. Table 2.1 details data sources and types in all schools.

Table 2.1: Data collection schedule for all programme schools

Participants	Data types				
Students	Baseline achievement in literacy or mathematics.	End-of-intervention achievement in literacy or mathematics.	Baseline attitude survey.	End-of-intervention attitude survey.	Interviews in case study schools
Teachers	Baseline survey.	End-of-intervention survey.			Interviews in case study schools. Collection of planning documents, reflective journals, samples of students' work.
Principals	Baseline survey.	End-of-intervention survey.			Interviews in case study schools.

Student achievement data: In reading, students' achievement data were gathered using Running Records using the Ready to Read series and the Colour Wheel, the Observation Survey, and Overall Teacher Judgement (OTJ). Changes in both raw scores and stanines (scores on a nine-point scale that indicate how well each student achieved relative to others of the same class level) were analysed where available. However, as a measure of student learning progress, stanines are imprecise, especially when used to evaluate progress during a short interval, as was the case in this evaluation. Namely, when a student is earning the same stanine score over time (eg, from year to year) the progress is considered to be normal. However, a student's performance may be anywhere in the range of test scores yet the student may be categorised within the same stanine. Additionally, a small difference in test score can change a student's stanine (eg, one question fewer correct could move a student one stanine down, to an adjacent stanine, if the student's score was at the bottom of the range for that stanine). Thus, a change in one stanine to an adjacent stanine is usually *not* taken as an indicator of change. Consequently, a real difference is assumed when scores differ by *two stanines*. Given the above considerations regarding the stanine's lack of precision and sensitivity to change, stanine analysis was treated with caution in our reporting.

In writing, asTTle levels and OTJs were used to assess students' achievement. In addition, the STAR test, consisting of four sub-tests (word recognition, sentence comprehension, paragraph comprehension and vocabulary range) was used to supplement the assessment of students' progress in reading. Raw test scores, converted into stanine scores, were used to establish a potential relation between the improvement in writing achievement with that in reading (eg, asTTle of writing and STAR; OTJ of writing and STAR). Subsequently, it was decided not to report STAR results because they added little to the other measures.

As part of their participation in the ALiM and SMT programmes all schools were asked by the Ministry to provide pre- and post-NumPA data to NZmaths and PAT: Mathematics pre- and post-data to NZCER. These data were made available to the evaluation team. We thank researchers in both of these organisations for allowing us to access these data in a timely manner and for their willingness to discuss with us matters to do with data presentation and analysis. All tests were administered at the start of the intervention (ie, at the start of Term 3) approximately 10 weeks later (close to the end of Term 3) and at the 15-week point in SMT schools (middle of Term 4).

Survey questionnaire: Online pre- and post-surveys were provided to principals, teachers and students. The pre survey sought principal, teacher and student understandings of current teaching and learning programmes. The post survey focused on participants' views on their experiences of the intervention programmes and their perceptions of changes in students' achievement and teaching approaches that influenced these changes. Teachers also supplied information about the student group (eg, group size, students' ethnicity, gender, and age) their teaching plan (eg, frequency and duration of lessons) and impressions of student achievement.

Case studies: Researchers visited the 25 case study schools to interview teachers, students and principals in the final stage of the intervention (end of Term 3 or Term 4 for SMT). Additional information was collected from teachers—written records of their reactions to their own teaching, about the programme, students' learning and examples of students' work.

Response rates

Survey response rates

Surveys were emailed to principals and teachers identified in the Ministry database with follow-up phone calls or emails as required to confirm/correct contact details and encourage participation. The response rates are set out in Table 2.2. Ministry-recommended student group sizes were used to estimate the number of students in the different programmes. For mathematics we estimated that, on average, there were six students per teacher (estimated N=1,144), for reading the average per teacher/group was estimated to be five (estimated N=312 students) and for writing we estimated that there were, on average, seven students per teacher/group (estimated N=623 students). Using these estimates we calculated student survey response rates.

Table 2.2: Survey response rates

Group	Subject	Pre			Post		
		Estimated number of participants	Number of full responses	Response rate	Estimated number of participants	Number of full responses	Response rate
	All principals	240	196	82 per cent			
Principals	Math ALiM				113	82	72 per cent
	Math SMT				27	19	70 per cent
	Reading and Writing				94	66	70 per cent
Teachers	All Mathematics	143	123	86 per cent	123	100	81 per cent
	Math ALiM				123	100	81 per cent
	Math SMT				29	26	90 per cent
	Reading	36	23	64 per cent	39	24	62 per cent
	Writing	89	75	84 per cent	118	76	64 per cent
Students	All Mathematics	1144	931	81 per cent	1144	949	83 per cent
	Math ALiM				699	580	82 per cent
	Math SMT				446	369	83 per cent
	Reading	180	132	73 per cent	180	105	58 per cent
	Writing	623	422	68 per cent	623	397	64 per cent

Note 1: Math ALiM and SMT and reading/writing principals did the same pre-intervention surveys; and Math ALiM and SMT teachers and students did the same pre-intervention surveys.

Note 2: It was estimated that there were 36 reading and 89 writing teachers in 94 schools and 143 mathematics teachers (exact numbers may differ from our estimates as teachers changed programmes and/or left or entered programmes at different times during the evaluation).

Student achievement data response rates

Teachers in reading and writing programmes recorded achievement data in an emailed proforma Excel spreadsheet. Teachers were able to type in student results freely, which created a great variability of the data format and consequently necessitated extensive data cleaning and format standardisation before the data could be used in the analysis. Reading data were submitted by 52 per cent of schools. Writing data were submitted by 63 per cent of schools.

The web-based databases for submitting PAT and NumPA data were strictly prescribed, which contributed to uniformity of data reporting and minimised the need for data cleaning. ALiM school response rates for PAT was 70 per cent and for NumPA was 79 per cent. The SMT PAT return rate was 63 per cent and the NumPA response rate was 92 per cent.

2.3 Data analysis

Student achievement data

Student achievement data were analysed by whole group and sub-groups of New Zealand European, Māori and Pasifika students that enabled comparisons between these groups. The amount of data available for the analyses varied across different tests and across different domains within tests (eg, NumPA, Running Records). This variation was owing to aspects such as: students lacking pre-programme or post-programme scores, students not being assessed in all domains or where responses were coded NA or '0' (there was an uncertainty about the validity of these '0' codes).

Data were cleaned before analysis using three steps. First, cases of double entries were dropped. Second, cases with more than 5 per cent of values missing were dropped, including background questions. Third, extreme values that exceeded the minimum and/or maximum in the response scale were checked and corrected as missing values. However, all data that reflected otherwise possible increment in student achievement were retained for the analysis. The particular analyses used are detailed as part of reporting findings and trends in Sections 3 (reading and writing) and 4 (mathematics).

The reliability of the mathematics achievement data analyses in which the results of New Zealand European, Māori and Pasifika students were compared is sound, given that the sample size for each of the ethnicities was sufficiently large. When the sample size was not sufficiently large for the particular analysis, the results and their interpretation were treated with caution and a note was made in the text referring to the results. Typical statistics textbooks use a sample size of 30 as a lower bound for large-sample inference about the mean of a quantitative variable and remind us that sample size required does not depend on the population size. Although there is no simple answer to the question of how large is a large sample, it is considered reasonably safe to make inferences about means if the sample is at least 100 for a single sample or 50 for each of two samples. With the exception of the reading programme, achievement data analyses were generally based on samples exceeding this critical value. Additionally, although the reading data sample size for each ethnicity was not 'large' it was sufficiently large and representative to allow reliable detection of the effects of interest. The detailed reading data sub-sample analysis may be considered to be not as robust as desired in terms of the sample sizes in each of the three ethnic groups (as the results can be somewhat more prone to the effects of extreme values). However, the sample is sufficiently representative and the results are sufficiently robust that we feel confident that the outcomes reflect the effects that could be observed on a larger sample and in the population.

As is the case with any large sample, a small number of outliers were observed in all analyses and these occurred for all three ethnicities of interest and included the samples' maxima and minima. However, because these extreme values were judged to be essential for answering the questions about accelerated learning they were not removed from the analyses; descriptive statistics calculated for all data generally did not uncover any departures from normality, or heterogeneity of variance across different comparison groups, and when on occasion the latter occurred, appropriate statistical corrections were made.

Judgements about acceleration

For reading and writing the approach for assessing accelerations was devised in collaboration with the Ministry's literacy advisor. The details of these calculations are summarised in the reading/writing data analysis section. For mathematics findings from the Numeracy Development Project, evaluations were used as a basis for making judgements about normal progress over a school year and adjustments made for the duration of the programmes.

Case study student data were also used to make judgements about acceleration. Owing to various methodological constraints related to the selection of control groups, it was decided that students in the programmes would serve as

their own control and data from students in case study sub-sample schools were used for this purpose. Specifically, for students from these schools, in addition to the achievement data from the beginning and at the end of the intervention, achievement data from the beginning of the school year were requested. This enabled a comparison of the magnitude of the improvement in student achievement without intensive teaching (ie, difference in achievement between the beginning of the school year and at the beginning of programmes in Term 3) and with intensive teaching (ie, difference in achievement between the beginning of programmes and at the end of programmes—the beginning and end of Term 3, or midway through Term 4 for the SMT students). This control comparison was only possible for ALiM mathematics owing to the low sample sizes for Term 1 data in both reading, writing and SMT mathematics.

Survey analysis

Survey data were analysed for all principals, teachers and students. Where comparisons were made between pre and post data, only those respondents with both pre and post data were included. Teachers' descriptions of student achievement and their pedagogy were combined with student data to answer questions about what strategies accelerated learning for Māori and Pasifika students. Teacher and student interviews, examples of students' work, judgements about the relationship of teaching approaches and student motivation, involvement and achievement from the case studies are used to elaborate and illustrate findings.

The evaluation required the analysis of multiple data sets. This presents challenges for reporting findings in a coordinated manner to outline the 'story' of the impacts of the additional learning programmes. Each data set is reported separately but attention is drawn to connections between them. Achievement data of all students, New Zealand European, Māori and Pasifika students are compared and contrasted as required by the research questions.

3. Reading and writing programmes

3.1 Introduction

In this section we present the results of the evaluation of reading and writing programmes for primary students in 94 schools who were achieving below expected levels. Results come from the sets of data described in Section 2—student achievement data; survey data from principals, teachers and students; interviews of principals, teachers and students in case study schools; and analysis of documents such as teachers' plans and records and student work samples.

The programmes run in Term 3, 2011 were:

1. Reading in Year 1: Shared book/language experience to supplement guided reading for students at risk of not achieving National Standards after one year at school.
2. Students in Year 2 at risk of not achieving the National Standards in reading.
3. Writing in Years 4 to 8 for students who were 'below' or 'well below' National Standards in writing.
4. Accelerating progress towards National Standards in reading and writing for English language learners (ELL) for whom English is their second language.

A principal aim of the evaluation of these literacy programmes was to measure changes in student achievement as a result of the programmes. Of particular interest was the extent to which student learning was accelerated, that is, the amount of learning in reading or writing increased at an amount higher than expected in one school term. Specific definitions are in the text that follows and listed in Appendix C. If accelerated learning occurred, the evaluation aimed to find what factors contributed to the increased learning, including teaching approaches, especially teaching that was responsive to Māori and Pasifika students; students' attitudes; how teachers were supported in their efforts to raise student achievement; and family involvement. Also of interest was the sustainability of the benefits of the programmes in the wider school.

3.2 Changes in student achievement

This sub-section presents the achievement of the reading and writing students on the various achievement measures. It provides details of the respondents such as Year level, ethnicity and gender. The results provided evidence of the extent to which students' learning was accelerated.

Reading achievement results

The following student achievement measures were used to assess reading:

1. Observation Survey: Five aspects are reported by mean scores and stanines.
2. Instructional Text Level by Year level.
3. Overall Teacher Judgement against the National Standard.

It needs to be noted that the reading student sample was comparatively small (n=112). There can be confidence in tests of significance on the whole group but ethnic sub-group comparisons should be treated with some caution, especially with a fairly small Pasifika group.

Twenty-three reading schools out of 33 provided both pre and post data on their students' reading achievement. Table 3.1 shows the numbers and gender in the three ethnic groups used for comparisons (38 New Zealand European, 41 Māori and 21 Pasifika) at each Year level. The sample size varied from test to test, depending on the student data provided by schools. It was agreed with the Ministry that only students in Years 1 and 2 would be included in the analysis since the focus of the reading intervention was on Years 1 and 2 and they would be combined. The Pasifika sample is smaller than the other two, which reflects the approximate distribution of students in the programme schools, that is, there was a smaller ratio of Pasifika students.

By the end of one full year at school, students are expected to achieve the National Standard of level 12 (Green of the Ready to Read Series Colour Wheel) an average expected progress of about four levels per term. By the end of two full years at school students are expected to achieve the National Standard of level 17 (Turquoise); it was estimated that students would progress by an average of 1.67 levels per term (to progress by five levels from level 12 to 17). After three full years at school, students are expected to achieve level 22 (Gold); students would progress by about one level per term (progress from level 18 to level 22). For students starting the programme below level 12, the expected rate was expected to be 2.84 (the average of Years 1 and 2).

To be able to make judgements to estimate progress, these expectations were needed to define rates of achievement and to assess whether there had been accelerated learning. These expectations were based on the advice from the Ministry's literacy advisor regarding the nonlinearity of learning and calculations based on the number of levels students at each Year level are expected to move in one year.

For the analysis, data from all years were combined. To show student progress and acceleration in reading we looked at the student data in a number of different ways. We used pre and post data for Instructional text levels, Overall Teacher Judgement and Observation Survey (both raw scores and stanines). We calculated the number of levels students moved (colour wheel and stanines). For Overall Teacher Judgement we estimated the number of students who were judged to be 'at' the National Standard at the start and at the end of the programme. For text levels we calculated whether students reached the level where they should be; we estimated whether the rate of change at which students progressed would get them to 'at' the National Standard at the end of the school year (not necessarily after one year at school).

Table 3.1: Number of reading students in each Year level by ethnicity and gender

	New Zealand European		Māori		Pasifika		Asian		Other		Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Year 0-1	5	11	8	6	4	7	1	2	5	2	51
Year 2	11	8	9	17	6	4	0	1	1	0	57
Year 3	2	1	1	0	0	0	0	0	0	0	4
TOTAL	**18**	**20**	**18**	**23**	**10**	**11**	**1**	**3**	**6**	**2**	112

Observation Survey

Raw scores and stanines were calculated for concepts about print, writing vocabulary, letter identification (ID), word recognition, and hearing and recording sounds. Students whose results were coded as NA or were lacking data either in the pre- or in post-intervention were excluded from the analysis and this results in some variations in totals. Results for New Zealand European, Māori and Pasifika students are in Appendix A Tables 1-10. Repeated measures analysis of variances (ANOVAs) using ***all*** available and valid students' data, group means revealed that students improved significantly from pre- to post-intervention on all measures (Table 3.2).

Table 3.2: Pre- and post-intervention means for all students, *F* and *p* values for Observation Survey measures

	N	Pre-intervention	Post-intervention	*F*	*p*
Concepts about print (0-24)	113	15.41	21.36	54.50	.001
Writing vocabulary (0-60+)	120	25.23	37.75	80.31	.001
Letter ID (0-54)	121	46.64	49.66	5.18	.05
Word recognition (0-23)	89	8.48	12.10	78.44	.001
Hearing and recording sounds (0-37)	112	23.67	32.32	117.36	.001

Note: The range of scores on individual tests of Observation Survey for children between 6.01-6.5 years is given in parentheses.

The following analyses were conducted using the sub-sample containing New Zealand European, Māori and Pasifika students' data because the Ministry of Education was interested in a comparison of these ethnic groups.

The results from separate two-way repeated measures ANOVAs revealed that student mean scores in all three ethnic groups improved significantly during the intervention and at a similar rate on each of the following aspects of the Observation Survey, with the tests of significance results noted. Full pre and post results are in Appendix A tables. The following analyses using Observation Survey scores (both raw and stanine data) were conducted using combined Years 1-3 data as agreed with the Ministry.

- **Concepts about print:** [$F(1,93) = 131.64$, $p < 001$]. Although all groups improved, by the end of the intervention New Zealand European students had significantly higher scores than Māori and Pasifika students (20.44, 18.70 and 16.75 respectively). The New Zealand European students also had higher average scores at the start of the programme. Māori and Pasifika students did not differ significantly from each other at the start or end of the intervention. The spread across stanines was wide both at the start and at the end of the intervention (see Tables 1 and 2 in Appendix A). Changes by stanines for all students were that out of 112 students, 13 experienced negative gain, 20 did not advance, 18 improved by one stanine, 30 by two stanines and *31 by three stanines.*

  Analysis of 104 New Zealand European, Māori and Pasifika students' data showed that at pre-programme 55 (53 per cent) students were at *stanine 4 or higher* (28 per cent were New Zealand European, 18 per cent Māori and 7 per cent were Pasifika). By the end of the programme the number at stanine 4 increased to 87 (84 per cent)—34 per cent were New Zealand European, 35 per cent were Māori and 14 per cent were Pasifika.

- **Writing vocabulary**: [$F(1,102) = 57.84$, $p < 001$]. Although New Zealand European students had, on average, higher scores than Māori and Pasifika students at the start and end of the programme, this difference was not statistically significant: pre-programme mean scores for the three groups were 28.97, 23.53, and 22.70 and

post-programme mean scores were 40.32, 36.36, and 35.95. At the start of the programme the majority of students were in stanines 2-5 and at the end the majority were in stanines 4-6 (see Tables 3 and 4 in Appendix A). Change in stanines for all students during the intervention: Out of 119 students 10 experienced negative gain, 22 students did not advance, 48 improved by one stanine, 24 improved by two stanines and 15 improved by *three or more stanines.*

Analysis of New Zealand European, Māori and Pasifika students' data showed that at the start of the programme there were 59 (57 per cent) students who were at *stanine 4 or higher* (25 per cent New Zealand Europeans, 20 per cent Māori and 12 per cent were Pasifika). By the end of the programme there were 90 students at stanine 4 or higher (86 per cent)—35 per cent New Zealand European, 37 per cent Māori and 14 per cent Pasifika.

- **Letter recognition:** [$F(1,94) = 28.16$, $p < 001$]. Pre-programme mean scores of New Zealand European, Māori and Pasifika students were 47.5, 45.06, and 46.47 and post-intervention mean scores were 52.76, 51.63, and 52.41. At the start of the intervention the majority of students were in stanines 2-7 and at the end of the intervention the majority of students were in stanines 3-7 (see Tables 5 and 6 in Appendix A). Stanine changes for all students were: Out of 119, 14 students experienced negative gain, 34 did not advance, 31 improved by one stanine, 14 by two stanines and 26 by *three or more stanines.*

  Analysis of 105 New Zealand European, Māori and Pasifika students' data showed that at the start of the programme 69 (66 per cent) students were at stanine 4 or higher (29 per cent New Zealand Europeans, 25 per cent Māori and 15 per cent Pasifika). Post programme the number of students at stanine 4+ increased to 90 (83 per cent)—31 per cent New Zealand European, 33 per cent Māori and 18 per cent Pasifika.

- **Word recognition:** [$F(1,77) = 75.58$] $p < 001$]. Pre-programme mean scores for the New Zealand European, Māori and Pasifika students were 9.59, 8.12, and 7; post-intervention mean scores were 12.81, 12.06, and 11.29. At the start of the programmes the majority of students were in stanines 2-6 and at the end of the programme the majority were in stanines 4-6 (see Tables 7 and 8 in Appendix A). Stanine changes for all students: Out of 118 students, 11 experienced negative gain, 28 did not advance, 34 improved by one stanine, 27 by two stanines and 18 by *three or more stanines*.

  Analysis of 104 New Zealand European, Māori and Pasifika students' pre data showed 60 (58 per cent) students were at stanine 4 or higher (27 per cent New Zealand European, 18 per cent Māori and 15 per cent Pasifika). By the end of the programme the number increased to 93 (89 per cent)—35 per cent New Zealand European, 42 per cent Māori and 16 per cent Pasifika, showing strong growth by Māori students.

- **Hearing and recording sounds:** [$F(1,95) = 98.65$, $p <001$]. Pre-programme mean scores for the New Zealand European, Māori and Pasifika students were 26.83, 22.96, and 19.94 and post-mean scores were 33.31, 31.85, and 32.12. At the start of the programme the majority of students were in stanines 2-6 and at the end of the programme the majority were in stanines 3-7 (see Tables 9 and 10 in Appendix A). Stanine change for all students: Out of 110 students, seven experienced negative gain, 20 did not advance, 33 improved by one stanine, 31 improved by two stanines and 19 improved by *three or more stanines.*

  Analysis of 96 New Zealand European, Māori and Pasifika students' data showed that at the start of the programme there were 50 (52 per cent) students who were at stanine 4 or higher (23 per cent New Zealand Europeans, 20 per cent Māori and 7 per cent Pasifika). By the end of the programme the number increased to 84 (87 per cent)—31 per cent New Zealand European, 39 per cent Māori and 14 per cent Pasifika.

The above results show that many students accelerated their learning (ie, group means for the observation survey measures went up significantly from pre to post programme). Regarding the change in stanines, a change of two stanines is taken to indicate a real change in learning and a change of three stanines would be a strong indicator of accelerated learning. However, these guidelines should be treated with caution given the length of the intervention and the constraints in using stanines as a measure of student progress. Anyhow, across different tests between 33 per cent (writing vocabulary) and 54 per cent (concepts about print) of all students went up by two or more stanines. In particular, in concepts about print 27 per cent of the whole group went up by two stanines and 28 per cent by three stanines. In writing vocabulary nearly half of all students increased by one stanine, 20 per cent by two and 13 per cent by three or more. In letter recognition 12 per cent increased by two stanines (22 per cent by three or more). Word recognition scores saw 67 per cent of all students increase by one or more stanines (23 per cent went up by two stanines and 15 per cent went up by three or more stanines). For hearing and recording sounds 75 per cent of all students went up by one or more stanines, with 28 per cent going up by two stanines and 17 per cent going up by three or more. Overall, there was little difference between the three ethnic groups and the growth in scores are in line with the ratio of each group in the total group.

The above data also show that a minority of students in the three ethnic groups made no progress or went down. It is not possible to explain why some students went down in their achievement although one can speculate that stanines' inherent lack of sensitivity to, and imprecision in, measuring progress may have contributed to such outcome. Additionally, an analysis showed that nine of the 13 students in concepts of print were in four of the teaching groups and the 14 students in letter recognition were spread across 11 teachers.

Overall Teacher Judgement of reading

Teachers provided OTJs against the National Standards for students at the beginning and end of the programmes. Accelerated learning was defined as the rating against the National Standard improving during the programme using the OTJ. It needs to be recognised that teacher judgements are, necessarily, a combination of objective and somewhat subjective measures to arrive at a 'global' judgement. In 10 weeks a student may need to make considerable (accelerated) progress for the teacher to judge them differently in relation to the National Standard.

Pre- and post-Overall Teacher Judgement for 95 usable returns are summarised in Table 3.3. There was considerable growth from 'well below' to 'below' and from 'below' to 'at' and a few moved to 'above'.

Table 3.3: Overall Teacher Judgement: Number and percentage of students' pre and post reading intervention

	Pre-intervention N	Pre-intervention per cent	Post-intervention N	Post-intervention per cent
Well below	54	*57*	13	*14*
Below	38	*40*	55	*58*
At	3	*3*	24	*25*
Above			3	*3*

Data from 88 students in the three ethnic groups (29 New Zealand European, 43 Māori, and 16 Pasifika) were used in the ethnic group analysis and reported in Appendix A, Tables 11 and 12. At the start of the programme all but two of the 88 students were categorised as 'well below' or 'below' expected achievement in reading and at the end of the programme the proportion had reduced to 69 per cent for New Zealand European students, 81 per cent for Māori students and to 50 per cent for Pasifika students. The proportion of New Zealand European, Māori, and Pasifika

students' teachers judged to have reached the National Standard was 28 per cent, 16 per cent and 44 per cent respectively. Fifty (57 per cent) were judged to have advanced one rating (19 New Zealand European, 28 Māori and three Pasifika), and eight (9 per cent) advanced by two ratings or more (one New Zealand European, two Māori and five Pasifika).

Two-thirds of the students in the three ethnic groups achieved *accelerated learning* in their programme in relation to the National Standard; of these, eight were judged to have advanced two ratings and notably, five of them were Pasifika students (out of the 16 Pasifika students in this particular sample).

Instructional text levels

Instructional text levels related to the *Ready to Read* series achieved by students were reported by teachers at the start and end of the reading programmes in Term 3. So far as is known teachers used either the Ready to Read Series or other texts benchmarked to those levels. The *Ready to Read* levels are recorded in the Colour Wheel of nine colours as follows: Magenta books are sub-levels 1 and 2; red books are sub-levels 3-5, yellow sub-levels 6-8, blue sub-levels 9-11, green sub-levels 12-14, orange sub-levels 15-16, turquoise sub-levels 17-18, purple sub-levels 19-20, and gold sub-levels 21-22. On the National Standards after one full year at school a child is expected to reach green books, after two years turquoise and after three years, gold. Two separate analyses were performed—one using nine colour wheel levels and an additional one using 22 sub-levels.

In terms of the nine colour wheel levels, at the start of the intervention the majority of Year 1 students were at the emergent colour readers of magenta (n=13) and at red (n=20) and the majority of Year 2 students were at the yellow (n=25) and blue (n=17) reading levels (data from 40 Year 1 students and 59 Year 2 students). By the end of the intervention the majority of Year 1 students were at the yellow (n=12; 30 per cent) and blue (n=11; 28 per cent) on the colour wheel chart, while the majority of Year 2 students were at the green (n=24; 41 per cent) and orange (n=17; 29 per cent) (Appendix A, Table 13).

Three Year 1 students remained at the same level at the end of the intervention, 13 (33 per cent) improved by one colour level, 17 (43 per cent) by two levels and seven (18 per cent) by three levels. In Year 2, two students remained at the same colour level at the end of the intervention, 19 (32 per cent) improved by one colour level, 30 (51 per cent) by two colour levels and 10 (17 per cent) by three colour levels.

Students in Year 1 and in Year 2 who improved by two colour levels or more were considered to have achieved accelerated learning. Thus, it would be reasonable to conclude that programmes worked equally well for students in the two reading programmes. In both groups over 60 per cent of students made accelerated progress in reading levels. Māori and Pasifika students' progress was similar to New Zealand European students.

Results were also analysed according to the 22 sub-levels of the nine colour levels of the Colour Wheel. One-way repeated measures ANOVA on the whole group (N=116) revealed that, on average, reading students' *instructional text levels* improved significantly from six at the start of the programme to 11 at the end.

Ethnic group comparisons of 40 Year 1 and 59 Year 2 New Zealand European, Māori and Pasifika students were carried out. A two-way ANOVA revealed that all three ethnic groups improved significantly during the intervention [$F(1,89) = 368.41$, $p < 001$] and at the same rate. Pre-intervention mean scores for the New Zealand European, Māori and Pasifika students were 6.25, 5.95, and 6.19 and post-intervention mean scores were 10.84, 10.80, and 11.57. The change in text reading levels by ethnicity is illustrated in Figures 1, 2 and 3 in Appendix A.

For Year 1 students, 28 (70 per cent) improved by four or more sub-levels during the intervention. The average increase in Year 1 was 4.8 levels. At the end of the programme 23 students (58 per cent) were at the text level eight or higher. It is expected that if these students continued to improve at least at the same rate in Term 4 (four levels per term) they would have reached level 12 by the end of the year, which is the expected level.

Given that, on average, progression of four levels was estimated as expected under regular circumstances, the observed average change of 4.8 levels indicates accelerated learning.

Year 2 students 54 (92 per cent) improved by more than 1.67 sub-levels (the estimated average rate of Year 2 improvement per Term) and, on average, improved by five sub-levels—thus they clearly demonstrated accelerated learning. At the end of the intervention 24 students (41 per cent) were at the text sub-level 14 or higher—of these, 18 were at the text sub-level 15 or higher. It was expected that if these students continued at least at the rate of 1.67 levels per term they would have reached level 17 by the end of the year (the expected Ministry of Education level). It should be noted that most of these students began the programme below the expected 12 sub-level of the Colour Wheel.

Reading levels and related factors

Changes in reading levels were statistically tested for any relationship to organisational forms, such as extra time, separate teaching space, multiple teaching sessions per week and provision of professional support by a principal. Data from 76 students showed that only professional support was related to significant difference in the magnitude of improvement in reading levels between students whose principals provided professional support to teachers and those who did not [$F(1,74) = 3.82$, $p = 0.05$] (average change in reading levels was 5.65 for students whose principals provided professional support to teachers and 4.53 for students whose principals did not). For each student, we calculated the change in reading levels between the start and the end of the intervention. We compared the average change for those students whose principals provided support during the intervention with those students whose principals did not provide support.

One factor that was statistically related to reading levels was teachers' years of teaching experience. Sixteen students were taught by teachers with up to five years of teaching experience (group 1), 10 students were taught by teachers with 5-10 years of teaching experience (group 2), and 32 students were taught by teachers with more than 10 years of teaching experience (group 3). The average change in text reading levels differed significantly between the three groups of students [$F(1,55) = 5.84$, $p < 0.01$] (average changes in text reading levels were 3.63, 4.3, and 5.69 levels for group 1, 2, and 3 respectively). A post-hoc test revealed that the group of students taught by the least experienced teachers experienced significantly smaller changes in text reading levels than the group taught by the most experienced teachers ($p < 0.01$). No other two groups of students differed significantly.

There were no significant differences between changes in reading levels and support from family/whānau, how often students were taught, the number of times teachers read to students, the level of principal support and whether the lessons were additional to regular classroom lessons. The duration of lessons did, however, make a difference. Because only three students were taught for 15 minutes on each teaching occasion their data were combined with the data from students whose lessons lasted for up to 30 minutes (group 1, N=42). Group 2 consisted of data from students whose lessons lasted longer than 30 minutes (N=26). The average change in reading levels differed significantly between the two groups of students—[$F(1,66) = 6.49$, $p < 0.05$] (average changes in text reading levels were 4.36, 5.81 levels for group 1 and 2 respectively). That is, students whose lessons were longer than 30 minutes improved significantly more during the intervention than the students whose lessons were less than 30 minutes.

Writing achievement results

The student achievement measures for writing were asTTle and OTJ. Accelerated learning was defined as: 1) advancing one rating of OTJ and 2) increasing by one or more levels on asTTle. Data from 320 writing students were used in the analysis of all writing scores and 300 students in the ethnic comparisons (147 New Zealand European, 94 Māori and 59 Pasifika). The sample size varied from test to test depending on the student data provided therefore the sample size varies for different results. The distribution of different ethnicities in the sample (Table 3.4) resembles the distribution of the ethnicities in the programmes.

In the full group almost two-thirds of all students were male (62 per cent) and 38 per cent were female. In the sample for the analysis, for New Zealand European and Māori students there were more male than female students, while for Pasifika students the number of male and female students was similar. Only students in Years 4-8 were included in the analysis. The Pasifika sample of students with useable data is smaller than the other, which reflects the numbers and ratios in the writing programme sample as a whole. Response rates were over 80 per cent across the three groups.

Table 3.4: Number of writing students in each Year level by ethnicity and gender

	New Zealand European		Māori		Pasifika		Asian		Other		
	F	M	F	M	F	M	F	M	F	M	TOTAL
Year 4	4	7	5	19	5	3	0	1	0	0	**44**
Year 5	17	15	12	14	12	15	1	0	1	3	**90**
Year 6	9	12	8	10	8	8	1	0	1	2	**59**
Year 7	10	32	0	10	0	1	0	0	0	1	**54**
Year 8	11	30	3	13	3	4	0	1	4	4	**73**
TOTAL	**51**	**96**	**28**	**66**	**28**	**31**	**2**	**2**	**6**	**10**	**320**

Note: F = female, M = male

Writing: asTTle

For the analysis of asTTle scores for the whole group, results were available from 226 students (136 students in Year-levels 4-6 and 90 in Year-levels 7-8). Since asTTle achievement data were spread out across 10+ levels and the sample size at some levels was reasonably small, it was not possible to calculate Chi-square statistics with any reliability and we report only descriptive statistics for this test. It was agreed with Ministry of Education to analyse the sample in two age groups. However, for detailed information on Year levels, see Tables B1 and B2 in Appendix B that show pre- and post-asTTle scores by ethnicity and Year level; the tables show expected levels by shading.

The overall analysis revealed that at the start of the programme in the Year-levels 4-6 the majority of students (61 per cent) were located at level 1A and 2B while in Year-levels 7-8 the majority of students (90 per cent) were located between levels 2P and 3P. At the end of the intervention, in Year-level 4-6 the majority of students (74 per cent) were located between levels 2B and 3B, while in the Year-level 7-8 the majority of students (69 per cent) were located between levels 3B and 3A. Overall, results are summarised in Table 3.5.

Table 3.5: Writing students: pre- and post asTTle level by Year-level

	Pre intervention				Post intervention			
	4-6		7-8		4-6		7-8	
asTTle levels	N	per cent	N	per cent	N	per cent	N	per cent
1B	7	5.1			5	3.8		
1P	13	9.6			4	3.1		
1A	31	22.8			7	5.3		
2B	52	38.2	1	1.1	24	18.3	1	1.1
2P	17	12.5	15	16.7	35	26.7	6	6.7
2A	9	6.6	16	17.8	21	16.0	8	8.9
3B	6	4.4	23	25.6	17	13.0	20	22.2
3P	1	.7	16	17.8	12	9.2	31	34.4
3A			10	11.1	3	2.3	12	13.3
4B			4	4.4	2	1.5	8	8.9
4P			3	3.3	1	.8	3	3.3
4A			1	1.1			1	1.1
5B			1	1.1			1	1.1

Note: Expected levels for Years 4, 5, 6 are 2P, 3B, 3P respectively and for Years 7, 8 are 4B and 4P.

In the ethnic analysis, achievement data from 214 students (94 New Zealand European, 79 Māori, and 41 Pasifika) were used because asTTle data were not available for all students. At the start, across all ethnicities, at Year-levels 4-6 the greatest proportion of students was found at level 2B while at the Year-levels 7-8 the greatest proportion was found at level 2A. Post data at Year-level 4-6 showed the greatest proportion of New Zealand European students at the level 2B while the greatest proportion of Māori and Pasifika students was found at the level 2P (expected levels for students in Years 4, 5 and 6 are 2P, 3B and 3P respectively). At Year-levels 7-8 the greatest proportion of New Zealand European and New Zealand Māori students was found at the level 3P while the greatest proportion of Pasifika students was found at the level 3B (expected levels for students in Years 7 and 8 are 4B and 4P respectively). In general, both Year-level groups accelerated their learning (an increase of more than one level). On average, all three ethnic groups of students, in both Year-level groups, improved by at least one asTTLe level during the programme, thus accelerating their progress.

Writing: Overall Teacher Judgement

Overall Teacher Judgement of writing for students who had both pre and post data were available from 257 students (169 in Year-levels 4-6 and 88 in Year-levels 7-8). At the start of the programme almost all Years 4-6 students (97 per cent) were judged to be ‘below’ or ‘well below’ the National Standard. The majority of students in Year-levels 7-8 were ‘well below’ (61 per cent) the National Standard and 38 per cent were ‘below’. At the end of the programme in Year-levels 4-6, 42 students advanced from ‘well below’ and 39 remained at ‘below’; 20 students remained ‘well below’, while 51 advanced from ‘below’ to ‘at’. In Year-levels 7-8, at the end of the intervention the majority of students were ‘below’ (n=50)—12 advanced from ‘below’ to ‘at’ the National Standard, 29 advanced from ‘well below’ to ‘below and 21 remained at ‘below’; 23 remained at ‘well below’ (Table 3.6).

Table 3.6: Overall Teacher Judgement of writing pre and post programme

	Pre intervention				Post intervention			
OTJ	**Year-level group 4-6**		**Year-level group 7-8**		**Year-level group 4-6**		**Year-level group 7-8**	
	N	**per cent**	**N**	**per cent**	**N**	**per cent**	**N**	**per cent**
Well below	68	40.7	54	61.4	24	14.2	23	26.1
Below	95	56.2	33	37.5	82	48.5	50	56.8
At	5	3	1	1.1	59	34.9	15	17
Above	1	.5			4	2.4		
	169		**88**		**169**		**88**	

Achievement data from 240 students (103 New Zealand European, 79 Māori, and 58 Pasifika) were used in the detailed analysis. Tables 3 and 4 in Appendix B show the proportion of students at each OTJ category at the start and end of the programme.

At the start of the programme two-thirds of New Zealand European and Pasifika students in Years 4-6 were judged to be 'below' the expected National Standard (63 per cent and 61 per cent) and about one-third were 'well below' (37 per cent and 28 per cent) while the proportion of Māori students was similar across 'well below' and 'below' (54 per cent and 46 per cent). In the Year-levels 7-8 over 80 per cent of Māori and Pasifika students (85 per cent and 86 per cent) were judged to be 'well below'; the proportion of New Zealand European students was similar across 'well below' and 'below' (54 per cent and 46 per cent).

At the end of the programme, at the Year-levels 4-6 for all three ethnic groups about 50 per cent of students were judged to be 'below' the expected National Standard (48 per cent, 52 per cent and 45 per cent) and about one-third of students were judged to be at the expected National Standard (38 per cent, 33 per cent and 31 per cent). In the Year-levels 7-8 over 60 per cent of New Zealand European and 71 per cent Pasifika students were judged to be 'below' while the proportion of Māori students was similar across 'well below' and 'below' (45 per cent and 45 per cent). On average, 16 per cent of students were judged to be 'at' the expected National Standard by the end of the programmes (18 per cent, 10 per cent, 14 per cent).

Thus, in regard to OTJ, all three ethnic groups, within each Year-level made, on average, accelerated progress during the Term 3 programme and at the end the three groups achieved comparable writing levels.

Summary

The results by group mean scores show that the overall groups of students in reading and writing on the measures of Observation Survey, instructional text levels, asTTle and Overall Teacher Judgement improved their scores to a level that was accelerated in terms of the definitions for each achievement measure. The three ethnic groups that were of key interest in this evaluation all made accelerated progress in terms of group mean scores and they achieved comparable amounts of learning.

In reading achievement all three ethnic groups significantly improved their scores for concepts about print, vocabulary, letter identification, word recognition and hearing and recording sounds. Overall Teacher Judgement was that all but three students were rated 'below' or 'well below' the National Standard at the start of Term 3 but that decreased to 69 per cent at the end of Term 3; 29 per cent of students were rated 'at' or 'above' and only 13 students remained at 'well below' after the programme (from 54 at the start). On instructional reading level all three ethnic groups improved

significantly and comparably. In both Year 1 and 2 over half of the students improved their reading by 2 or 3 levels, therefore accelerating their learning.

In writing, group means for asTTle were evidence of accelerated learning. By the end of Term 3 the writing achievement of the three major ethnic groups (New Zealand European, Māori, Pasifika) improved, on average, by at least one level on the asTTle test. Overall Teacher Judgement was that all three ethnic groups improved in each Year level. Collectively, results indicate that the majority of New Zealand European, Māori and Pasifika students accelerated their learning in reading or writing.

Māori students

In reading, OTJs were that 67 per cent of Māori students were 'well below' the National Standard in reading, 33 per cent were 'below' and none were 'at' the level when the programmes began. At the end of the reading programmes only 14 per cent were judged to be 'well below', 67 per cent were 'below', 16 per cent were 'at' the level and 2 per cent were rated as 'above' the level. This represents a major shift and shows that the majority of students accelerated their learning by improving at least one rating. Māori students, as a group, significantly increased their Colour Wheel instructional text levels from sub-level 6 to 11, indicating accelerated learning for the majority. Observation Survey results (Appendix Tables 1-10) showed significant increases for Māori students on all categories, indicating accelerated learning for the majority, that is their learning increased by more than would be expected in the same classroom time.

Writing: Overall Teacher Judgement showed that the majority of students accelerated their learning by advancing by at least one category. However, the sample number of students at some Year levels was quite small.

Pasifika students

In reading, OTJs of Pasifika students at the beginning of the programme were 56 per cent were 'well below' the National Standard for reading, 44 per cent were 'below' and none were 'at' the National Standard. At the end of the reading programmes 31 per cent were still 'well below', 19 per cent were 'below', 44 per cent were 'at' the level and 6 per cent were rated 'above' the National Standard. The majority of students accelerated their learning by achieving an improvement of one rating. Importantly, 50 per cent moved from either 'well below' or 'below' to reach the National Standard or go to 'above' the National Standard. Pasifika students—as a group—significantly increased their Colour Wheel instructional text levels from sub-level 6 to 12, indicating accelerated learning for the majority. Observation Survey results (Appendix Tables 1-10) showed significant increases for Pasifika students on all categories, indicating accelerated learning for the majority, that is their learning increased by more than would be expected in the same classroom time.

Writing: Overall Teacher Judgement showed that the majority of students accelerated their learning by advancing by at least one rating. However, the sample number of students at some Year levels was quite small.

The achievement results presented in this section show that large numbers of students accelerated their learning in reading and writing. The results are consistent with a high level of expectation that principals and teachers had before the programmes began—that student learning would increase more than it usually would in the equivalent time. Analysis of achievement scores show that at the individual student level scores varied from accelerated to a decrease within and across schools. A minority of students either did not increase their scores or in a few cases got lower post scores. It was not possible to be categorical about the causes in these programmes but it is well known that student learning is not always linear and can be affected by many factors (Hattie, 2009).

The results of student achievement need to be related to findings that will reveal more detail about what schools and teachers did to positively influence learning. What organisational arrangements did schools make for the programmes?

What did teachers emphasise in their programmes and what support did they get? What did they change in their teaching? How did their students react? What strategies did they have for Māori and Pasifika students? Were families/whānau involved and if so, how? How can learning be sustained beyond the programmes? What impact upon schools might the programmes have?

3.3 Perceptions of change

To set the results of student achievement in the context of the schools where the programmes were taught we have outlined what principals and teachers in the reading and writing schools expected before the programmes began and what they saw as the aims and intentions.

Initial expectations

What were the expectations of principals and programme teachers before the programmes began? There was evidence from surveys, interviews in 15 case study schools and training/planning days that the principals of the reading and writing schools played a major role in the expectations and design and support of the programmes. Principals were eager to utilise the resource of teacher time provided by the Ministry of Education. Principals were asked why they wanted the school to be included in the programme in reading or writing. The major reason given in the pre survey (76 mentions out of 88 principal responses) was the chance to improve the literacy achievement of students who were 'below' or 'well below' expected levels and who had potential to raise their achievement with intensive teaching. Some said that the programme goals matched the school's aim to target "underachieving students" so there was strong support for the Ministry of Education initiative to provide teacher release time. Typical principal comments were:

> It is an opportunity to raise the writing achievement of a group of students and to support Ministry of Education initiatives to raise student achievement.
>
> We are currently in a schooling initiative with a focus on reading moving into writing and this project sits well alongside our own initiative.
>
> Our writing [achievement] was low across the school and we needed to try something different.

The other reason most mentioned—by 19 principals—was an opportunity for the school to use its initiative to plan and teach a structured programme that included attention to teaching approaches and reflection on the teaching by teachers.

A number of principals saw the programmes as an opportunity to provide professional development for classroom teachers working alongside an expert teacher, even though this was not a goal of this Ministry of Education initiative. However, principals had responded to the message given in the planning days that any positive outcomes from the programmes should influence what happened more widely across a school, for example, the programme teacher sharing successful teaching approaches with other teachers.

Overall, all principals appeared to have a good understanding of the immediate intentions of the programmes in terms of designing programmes that would raise the achievement of students who were performing below expectations.

The planning and training days run by the Ministry of Education prior to the programmes were regarded by most teachers as an effective way of briefing them on the aims of the programmes and engaging them with teachers from other schools to discuss teaching approaches. Interviews with case study teachers and principals showed that they were alerted to the need to consider how to sustain benefits of the programmes. Generally, teachers were positive about the planning and training days, but some believed that the directions and approaches were somewhat vague and they should

have been given more explicit instructions on how to carry out the intervention in literacy. However, this view may show a lack of understanding of the aims of the programmes, that teachers would take responsibility for planning and implementing a programme to suit the local situation. On the other hand, most teachers responded positively to the general aims; they came to see advantages in the initiative because it was a chance to use established teaching methods and modify them to suit specific children. They tended to be confident that within the broad parameters they could make appropriate decisions about teaching and learning approaches. Similarly, about two-thirds of principals rated the training and planning days prior to the intervention as either excellent or very good.

The achievement results outlined above provide evidence that many students accelerated their learning and this outcome is related to the high level of expectation and optimism by teachers and principals that learning would improve more than usual.

3.4 Nature of implementation models and organisation

We now look at the organisational arrangements that were made by school leaders to enable a teacher to work intensively with a small group. In all schools, preparation for the programmes was carried out in Term 2, 2011. Our evidence from surveys and interviews is that principals played a key role in the design of the programmes. School preparation included the logistics of teaching space; lesson scheduling; student selection, including decisions about the number, age and ethnicity of students; selection of the teacher; support for the teacher; and the processes of planning, teaching approaches and recording and sharing of student achievement. The overall structure of the programmes was that school leaders had the flexibility to design a programme that took advantage of, and built on, school initiatives and expertise. Consequently, there were variations in the organisational forms—or models —developed in schools. The findings that follow relate to the models (forms of organisational arrangements) that were made by school leaders and teachers and covered planning for teaching, record keeping by teachers and student reactions.

Models of intervention

In the reading and writing schools there were two major forms of organisation for the programmes. In the first model, students were withdrawn from their regular classrooms and taught by their regular teachers or another teacher. In most cases the students were from two or more classrooms and in fewer cases all from the same classroom.

In the second model, students were taught in their regular classes. There were two main arrangements; the teacher was not the regular classroom teacher or in some cases—especially in the writing programmes—the teacher was the classroom teacher. When the programme teacher was not the regular teacher, the programme students were taught within the regular lesson. Some writing groups were taught within regular lessons without extra teacher input. If the programme teacher was also the regular teacher, a relief teacher took the class while the intervention programme was being taught at the same time.

Teaching session length varied, as did the number of students per group. It can be seen that there was a general blueprint for how the programmes were organised but schools made specific arrangements to suit their circumstances, such as the kind of space that was available and the availability of relief teachers.

Teacher selection

Across all schools teachers were chosen because the principal rated them as good and experienced practitioners in literacy (sometimes literacy generally; sometimes specifically reading or writing) who were also enthusiastic about the opportunity the programmes presented. There were various combinations of arrangements for the teaching. Some reading teachers were also Reading Recovery teachers or undertaking the training. In some cases the programme teacher worked in the regular classroom of another teacher. In a large reading school, two groups of students were

chosen and each was taken by a different teacher; they were regarded as competent teachers of reading who would benefit from parallel professional learning by an experienced literacy teacher who was given release time for this, including observing lessons by the two teachers. In one medium-sized school, the intervention teacher for Stream 1 reading worked with nine children from one class taught by a beginning teacher and taught them in sub-groups of two, three and four students in a room adjoining the classroom. The programme teacher was also the tutor teacher of the beginning teacher, so lessons taken by the programme teacher were observed as part of the beginning teacher's professional development. The teachers of writing were, similarly, seen as enthusiastic and effective teachers of writing.

In some cases the teacher of the intervention was the students' regular teacher and sometimes not. For reading: of the 23 teacher returns, 60 per cent of students were from the teacher's regular class and 40 per cent were from another class. For writing: of the 73 teachers, 79 per cent of the students were from the teacher's regular class and 21 per cent were from another classroom.

Student selection

Through online surveys, principals (n=86) of reading and writing schools reported a number of reasons why students were selected to take part:

- because of their low achievement level (92 per cent)
- because they showed potential for accelerated learning (47 per cent)—that is, although they were 'below' or 'well below' in achievement the teachers believed they would respond to intensive teaching
- the likelihood that they would benefit from learning in a small group (45 per cent)
- the chance to target Māori students (26 per cent) and Pasifika students (15 per cent).

These criteria were linked to the Ministry of Education's initiative notes given to schools (*Literacy Intervention Pilot Project 2011*). All schools reported consultations in Term 2 over selection, usually including the lead teacher of literacy, the principal, classroom teacher and the programme teacher. In a number of case study schools a selection criterion was to select children who had not been in any previous intervention in literacy. It was common to select children who showed potential to learn more rapidly than usual. It was usual for school leaders and classroom teachers to have had extensive discussions around student entry to the intervention before final decisions were made; that is, typically, a lot of thought went into the selection across the schools.

Group size

The number of students selected for additional learning varied across groups as shown in Table 3.7.

Table 3.7: Number of students per school in writing and reading

Writing		Reading	
No of students	**No of groups**	**No of students**	**No of groups**
2-3	11	3-4	10
4-6	32	5-7	10
7-9	21	8-12	3
>9	12		

All reading groups were taught between three and five times per week. The teaching sessions were additional to the students' other usual classroom reading in 16 of the 23 groups, and instead of the other usual classroom reading in seven groups. All writing groups were taught between one and six times per week. The teaching sessions were additional to the students' other usual classroom writing in 52 of the 73 (71 per cent) groups.

Number of sessions per week and duration

The number of lessons per week and the duration of lessons are shown in Tables 3.8 and 3.9.

Table 3.8: Number of reading lessons per week and durations (minutes)

No of reading lessons		Durations	
No of teachers	**Times per week**	**No of teachers**	**Duration of lessons**
4	3	4	Up to 15 mins
8	4	11	16-30 mins
11	5	8	>30 mins

Table 3.9: Number of writing lessons per week and durations (minutes)

Writing lessons per week		Durations	
No of teachers	**Times per week**	**No of teachers**	**Duration of lessons**
4	1	8	Up to 15 mins
2	2	20	16-30 mins
9	3	45	>30 mins
24	4		
34	5 or more		

The programmes were to accelerate student learning in reading or writing so it is surprising that four reading teachers and eight writing teachers taught short lessons of up to 15 minutes and some teachers taught just a few times per week—and one just once. However, some students were taught in their regular classroom and programme teachers may have worked with each student individually and it is possible that they answered the survey question differently than we intended.

Case study schools

Data were collected in 15 case study schools. Some had more than one group of either reading or writing students. Together, they had four reading 1 groups, five reading 2 groups, 17 writing groups and one ELL group. They provided evidence of how the variations in the models adopted by the schools played out in practice. For instance, the case study reading schools had groups of between four and seven students, except for one school with nine (taught by two teachers). Three of the four reading 1 case study schools withdrew the reading groups from the classroom and the fourth had a combination of withdrawal and working within the classroom. Four of the five reading 2 groups were withdrawn from the classroom. Some groups were subdivided for more time on one-to-one teaching. Six of the seven writing groups were withdrawn from the regular classroom and the remaining model was that the school had 10 groups, each taken in the regular classroom by the usual teacher. The typical writing group size was five to eight students. The ELL group of eight students was taught by a combination of daily withdrawal for writing and reading, which was taken in the regular classroom. Schools shaped the arrangements to capitalise upon factors such as teacher availability, time and space.

The diversity in local implementation is shown in the following models from three case study schools.

They were chosen to show the variations in the way different schools designed programmes. The first model is for Year 1 reading. Release was provided for two teachers regarded by the principal as 'highly skilled' who regularly met with the class teachers informally during Term 3 to assist their reflection on their practices. K taught six children, two boys and four girls (one Māori, one Indian, three New Zealand European, one Samoan); four from one room and two from another. None of the children were from K's own classroom. They had been at school for at least 1-2 full terms, were under the age of six before the first day of Term 2 and were identified as at risk of not meeting the National Standard for reading. They were possible candidates for Reading Recovery. Any children who were already receiving other support in literacy were not included in this programme. The children were withdrawn from their regular classes and worked in a small room at the back of K's classroom. They participated in the regular classroom reading and writing programmes in addition to the intervention. The other teacher also taught a withdrawn group from several classrooms.

In the second example the school leaders called the reading 2 programme 'Read as a Reader' and decided to have two class teachers working with a group each to share ideas. They chose two young, average 'open' teachers who were keen about improving their teaching of literacy and were willing to be observed and take on board new ideas to improve teacher effectiveness, as well as lift the children's reading. The programmes ran in parallel. The principal said that evidence from previous school professional learning showed that these two teachers needed help with observing literacy learning strategies and these skills became a junior school focus. 'Visiting colleagues' (two ex Reading Recovery teachers) were an essential part of the intervention. They spent two hours each week helping the two teachers and observed other teachers in the junior area at the same time to ensure the programme did not get 'watered down' from teacher to teacher and everyone was getting the same messages and support with analysing running records and linking them to future lessons. This is a good example of a principal who viewed these activities as building the teaching capacity of reading in the early years for students by linking the programme to school reading policy and spreading its influence.

The third school had two writing groups each of six Year 5 students, the majority were Pasifika students who were 'below' National Standards level in writing. The school literacy leader coordinated the writing programme and cooperatively planned and implemented it with the intervention teacher. They decided to divide the students into gender groups and taught one each for four days per week. They included a number of activities to increase the students' knowledge of how English is structured and to strengthen their writing skills. Activities included dictation, reading and analysing journal stories, highlighting language features (pronouns, etc) deconstructing passages, playing language games and activities that focused the students on forms of language.

These three cases exemplify several important factors that generally applied across the whole group of schools and could be seen in programme plans and ongoing teacher notes. First, programme teachers were given support initiated by the principal and mostly done by colleagues from within the school; second, other expert help was utilised; third, a plan was usually cooperatively designed for the whole programme and reviewed during the teaching; and finally, they demonstrate a sense of accountability in school leaders that it was important to make the programme succeed in lifting both student achievement and teachers' effectiveness.

Students' experiences and reactions

How did students react to the organisational arrangements? Interviews with students in the case study schools showed a strong preference among writing students to be withdrawn into a group. A number of students in case study schools—especially the writing students who were older than the reading ones—commented they enjoyed better learning conditions in their withdrawn group. They said that when they worked in a separate group they could concentrate on

their work better than in their usual classroom; they said there were fewer or none of the distractions from classmates they experienced in their regular classes. Distractions mentioned were noise and interruptions by other students to ask a question or talk about unconnected matters or just to 'be a nuisance'. One student summed up the general view: "It is quiet [in the group] and not distracting" and "It is easier to work in a small group". A girl in a writing group said, "We have boys in our class who annoy us because they are so loud". On the other hand, a few students said they sometimes missed out on class activities when they were in the group.

There was a high degree of students liking their programme teacher and in a numerous case study school students said they felt positive about being 'special' and being given extra help. Most students liked having the full lesson time with the teacher "all to themselves" and said it helped them with reading and/or writing.

In summary, the two most common 'models' in both reading and writing were students:

- were withdrawn from their regular classes to work in a group in another space; some groups were from just one class, others from two or more classes; and
- remained in their usual classroom and were taught by the additional learning teacher in that setting, sometimes as a group and sometimes individually.

Within both of these models there were variations. In some schools one teacher took the group; in others two teachers took some students each, usually adding up to a larger number of students. Some students were taught by their usual teacher; others by another teacher. Most teachers were supported within the school either by a literacy lead teacher and/or another teacher such as a Reading Recovery teacher or the principal. A number of school principals also arranged support from outside the school.

The model for the ELL case study school was to withdraw children for language learning and writing; and reading was taught in the regular class from which they all came.

3.5 Pedagogical approaches

Teachers and principals recognised that their expectation of success needed to connect with the teaching approach used. Informal comments from the planning days indicated a realisation that 'good' teaching was needed and sound planning was a foundation for good teaching. In case study schools, for example, all teachers set out a clear plan of teaching and learning for the 10 weeks of the programme, usually in consultation with literacy lead teachers or others and with the classroom teacher when they were not the intervention teacher. Rules and expectations were established with students at the outset of a programme. Within these parameters, student behaviour was found to be orderly and cooperative; indeed, most students who were interviewed were enthusiastic because teachers were enthusiastic, used continuing encouragement to students and gave regular feedback about their reading or writing. Interviewers in schools were shown teacher assessment records of children writing and reading at improved levels; improvement seemed to be related to teachers and students focusing upon a clear set of goals and expectations. For example, teachers showed interviewers graphs of student progress throughout Term 3 and in some cases writing progress charts were displayed on noticeboards for the group to follow. Students knew the progressions of levels they needed to achieve.

Expectations of success were linked to *changes* in teaching approach. A number of teachers in case study schools were using a handout from the training/planning days run by the Ministry of Education called *Dimensions of effective practice* as a guide when deciding on their own teaching approach. It is not known how widely this guide was used in other schools. A number of case study teachers mentioned that they tried to instil a sense of group ownership of learning; for example, one teacher of writing put success down to:

> Giving each student ownership of their feelings and writing-learning journey. I found as I deepened the students' knowledge required in constructing a good piece of writing, and used good models of writing which were linked to authentic situations, the students were very committed to the task. I always tried to build upon the existing foundations and existing structures within the writing framework of our school so I could adapt these to accommodate fresh insights for the students and the teachers.

Thus, this teacher was prepared to change her teaching and this will be discussed later.

Culturally responsive pedagogy

In Section 2 we outlined that in the planning days prior to the programmes teachers were encouraged to practise *responsive teaching* and, in particular, *culturally responsive pedagogy*. Given this emphasis, in this evaluation we looked at the extent to which teaching approaches in reading and writing were responsive to the culture of children and their backgrounds and experiences. Evidence from surveys and interviews with principals and teachers is that the term culturally responsive pedagogy is not necessarily used by a lot of teachers, although it was clear that the beliefs and practices of 'culturally responsive pedagogy' were well known to them. Presentations at the training/planning days before the programmes began are likely to have reinforced teachers' views about the nature and value of culturally responsive teaching because in pre-programme survey responses the following aspects were mentioned numerous times:

- develop knowledge of students' cultural background, prior knowledge and personal strengths to build a sense of belonging and acceptance within students
- develop my own knowledge in accordance with my skills and the needs of my students to implement a range of teaching strategies to meet the wide variety of learning styles in the room
- empower the learner to take control of their learning and help them construct their next learning steps
- encourage participation by families in our class activities and outings
- provide opportunities for students to work collaboratively in small groups of mixed ability or pairs
- use examples and analogies from students' lives
- use lots of different skills: listening, speaking, reading and writing
- use scaffolding, modeling, and have high expectations
- daily observation and feedback on learning.

The range of statements did not alter in the post survey, which suggests that the programme teachers were already well versed in the characteristics of culturally responsive pedagogy. However, we had no way to measure the extent to which these teacher views were reflected in their teaching practice in the programmes. Even so, teachers self-reported aspects of their teaching that are reported later. Also, the accelerated learning achieved by the reading and writing groups—in terms of group means (including the three ethnic groups' means)—suggests widespread use of the above success-related factors. Furthermore, there was a widespread positive reaction by students about their experiences with programme teachers. Other success factors will be reported later.

Findings are now presented that show how teachers taught reading and writing and how they changed their approaches to adapt to the students' learning needs.

Teacher aims

Evidence from a study of teachers' plans showed that the most emphasised goals teachers had for student learning and their own teaching were to:

- increase students' content knowledge in reading or writing
- develop specific learning strategies in addition to content to help students with reading or writing
- encourage students to be risk takers with their learning of reading or writing, that is, to try different ways of learning; to be unafraid to try even if the strategy did not succeed at first
- shift student attitudes towards reading or writing to believing there were useful things to get better at
- foster in students a love of reading or writing, and a desire to improve
- have high expectations that students would improve their learning in reading and writing more than they usually would in the equivalent time—to accelerate learning
- adapt teaching to be responsive to the needs of all students, with particular emphasis on Māori and Pasifika students
- keep systematic and regular records of student achievement.

Overall, teachers aimed to improve student achievement by reflecting on their own teaching of reading or writing based on the established approaches that they already used in their classroom teaching. The above aims were consistent with the messages that teachers were given in the planning days before the start of the additional learning and reviewed in workshops after the teaching. Teacher data showed—like principals—that teachers were optimistic that student achievement would go up more than it would otherwise, a matter that is discussed further later in this section.

The role of planning and record keeping

Evidence from several sets of data—surveys, training day interaction and case study interviews—was that planning and record keeping were seen by principals and teachers as very important parts of a teacher's preparation for a programme and for tracking learning throughout the teaching. This is borne out in the post-survey results that show that almost all teachers of reading and writing kept regular records. The following aspects were recorded daily or weekly: lesson planning, lesson evaluations and reflections on their own teaching. Most kept records of student achievement daily or weekly. These results were consistent with what the research team observed on planning days and during school visits and noted from plans sent in by teachers; they are also consistent with a high level of enthusiasm observed during visits to case study schools.

Involvement of family/whānau in programmes

In the pre-programme planning days, principals and teachers were encouraged to involve family/whānau in a child's learning in programmes. Involvement was evident in three ways: being informed about a child's selection for a programme that sometimes included the chance to meet teachers at school, parents going to a school to see the programme in action and parental help at home with reading and writing.

Teachers were asked about the level of support for the programme they thought there was from families/whānau. Twelve of the 23 reading teachers thought that parents were *very* supportive of their child being in the reading programme, six said they were supportive, three neither supportive nor unsupportive, one said they were very

unsupportive and one chose the answer of 'don't know'. Eleven out of the 73 writing teachers thought that parents were very supportive of their child being in the writing programme, 29 were supportive, 32 were neither supportive nor unsupportive and one rated level of support as 'unsupportive'.

Not surprisingly, the actual involvement of the family/whānau in a child's programme varied. Schools usually informed parents that their child was to be included in a group to get extra reading or writing. In literacy case study schools it was common for reading and writing activities to be sent home with an expectation that the parents would give support to the child. Several teachers believed that children in families/whānau that supported and helped the child at home made greater achievement and their motivation increased. Typically, parents were asked to hear their child read their school reading books or read what they had written at school, thus reinforcing what was learned at school. Students interviewed in case study schools where parents did these activities were positive about the impact upon their progress. There were examples of students reporting that they had read their written stories to parents for the first time in their schooling.

One writing teacher explained how she had developed a close relationship with the parents in a low decile school: "We held an afternoon to explain the programme and the [school's] expectations of the teacher, students and the parents. Parents had access to the teacher's email and phone number and open access to the teaching space if they wanted to observe [but none did]. Resources were sent home to support the spelling of each student as a hard copy and on an interactive PowerPoint. Parents did touch base informally during lunch times or after school." Five of the children were from Māori families/whānau. While it is impossible to measure the impacts upon student achievement of these contacts, the teacher believed they helped the relationship between families/whānau and the school in three ways: better understanding of the programmes and school curriculum, seeing that their views and presence were welcomed in the school, and the potential to achieve more positive attitudes in both family/whānau and students. Other teachers reported similar activities to include parents, particularly Māori and Pasifika parents.

Overall, teachers believed there were links between parents'/whānau involvement and student learning and attitudes even if this was simply being supportive of the student getting additional support in reading or writing. Some teachers said there were more tangible indicators that parental help at home helped reading for children, such as the examples given above. It was impossible to find out how many parents did these things. Most teachers reported that most parents were supportive and some parents helped at home and some did not.

What did teachers do differently that influenced learning?

We investigated whether teachers changed their teaching approaches for their programme students. Teacher and school plans provided evidence of teachers carefully addressing the quality of their planning. Many teachers' planning and reflection notes showed they were able to focus on a smaller number of students than usual and were therefore able to plan lessons in more detail, including an outline of each student's programme; keep detailed records of student achievement in each lesson; make more contacts with the parents/whānau of the students; and reflect on teaching. Numerous survey and case study teachers mentioned the value of their lead teacher who acted as advisor, mentor and co-planner; and that their interactions with this person 'spurred' them on to keep quality records and adapt their teaching. Records provided a focal point for productive pedagogical discussion with colleagues. An important record for many was a journal or ongoing notes in which a continuous record of teaching was kept. A number of teachers reported—in their records—that they followed a "teaching as inquiry" approach, that is, to continually review their teaching and modify it where they thought it was necessary. Numerous other teachers said in survey responses that they responded to students' needs by altering their teaching in specific ways.

How did teachers alter their teaching? All teachers interviewed in the case study schools reported doing things differently in their teaching of the group. Nearly all of them said their planning for the group was more focused than usual for a whole class and this was verified by observing their records of planning. They reported that while they found it was demanding work it was satisfying because the detailed plans resulted in lessons that were structured to provide children with learning related to their specific learning needs in reading or writing. The day-to-day learning was cumulative and it was easier to 'keep track' of each student's learning rather than in a whole class, because teachers had fewer students to know well. They came to understand each child's specific learning approaches and techniques and could react accordingly. Aspects mentioned included a student's level of confidence in reading aloud in front of others and willingness to orally share ideas. All teachers said they kept more detailed than usual running records of student achievement and samples of student work. They usually made these available to the students' classroom teacher to use alongside classroom assessment records.

Reading

In surveys teachers generally said they used their usual teaching approaches when they taught their reading programme students. However, they made modifications in specific ways. This reading teacher's survey response exemplified many reading teachers who changed specifics: " I allowed each student greater opportunity to bring personal experience to the text. I ensured that each student read the whole guided text each time. I provided individual support when they read familiar and guided texts. I kept learning intentions small and specific, building on each one. I modelled just the learning intention I wanted them to focus on at first (using a shared book) and provided specific feedback on that learning intention. I did not carry on unless I had the attention of all students in the group. I asked students to read the learning intentions and explain how to achieve them."

Another difference mentioned by a number of teachers was that they formulated reading goals for the individual "rather than just a group goal." Many cited using a combination of one-on-one (teacher–student) within the group context so that each student had more teacher time related to specific reading needs. This time for one-on-one was a common comment about how teachers changed the emphases of their teaching. For example, one teacher said, "I maintained the way I have been teaching guided reading but spent much more time with shared reading and using big books to enhance writing." Linking reading and writing was a common theme in teachers' comments.

In survey responses over two-thirds of the reading teachers said their emphasis upon particular teaching approaches made the most difference to their students' achievement in reading. Their comments are consistent with the above comments they made on changes to teaching. Particular strategies included: "selecting books which interested them [students]"; "giving instant feedback"; "teaching students to use reading strategies that they could remember"; "read a big book every day and children liked joining in the repetition of the book and the related activities like grammar of the text, finding similarities in words, acting the meaning of a word, using clues to identify words". The focus upon established teaching approaches that contributed to student achievement improvements is further demonstrated in this comprehensive teacher response about what made her teaching effective for the target Year 1 children who were taught within the whole class.

> I created opportunities for success. I used class books with text shaped with the children, as the result of a common language experience (this) was very successful. The target children knew what the book was about, became more aware of the patterns of the text and vocabulary used. The language was rich and the books provided the opportunity for each child to begin to develop a positive perception of themselves as readers. They could recognise the words and talk about what they had read. They were 'reading' and this was a powerful intrinsic motivation. A concept circle provided many and varied opportunities to use the vocabulary contained in the text. The Owl and the Pussy Cat rhyme was a great example. Time to use the vocabulary and ideas was needed before we would move on to a book with

> new words and ideas. Developing reading processing systems on known books everyone can see was useful. Daily-shared reading was part of the programme. I increased the frequency of running records and taught moment by moment in response to those needs.

The above comments are a good summary of many points made by reading teachers in terms of how they focused upon specific skills of learning. They show a range of adaptations and the use of established approaches modified to suit the reading group, ie, responsive teaching.

Writing

Teachers of writing also reported in surveys that they used their usual approaches. However, teaching one group meant they could focus on particular writing aspects without needing to manage a whole class. Also, the students got access to more teacher time for their specific learning. Fairly typical of other teachers' comments is the following comment by a writing teacher on the links to better student learning: "Being released to write with a small group of similar ability and needs children away from distractions. Being out of the whole class situation where perhaps the students could be overlooked and then being able to contribute. Gearing activities to suit their interests. Regular writing, practising what was covered in small/intensive sessions. Getting away from the idea that a whole story had to be done, instead doing bits of stories, takes away the thought of a massive task in front of them. They liked writing straight onto laptops. There was variety in the writing. We linked writing to reading, especially in vocabulary development and modeling of great writing".

In the above comments, the teachers indicate what they saw as the benefits of focused, systematic teaching approaches.

There were many comments by over 80 writing teachers in the survey. They showed that nearly all of these teachers made changes to their teaching of the group, compared with their classroom teaching. However, they were not so much *new* approaches as adaptations to suit teaching one group. They were also influenced by the organisation of the programme. For example, some programme teachers worked in the classroom of the targeted students. In one, the teacher said, "My role was to support the classroom teacher. I observed the teacher and students, guided students' writing, taught demonstration lessons and gave feedback to the teacher and students".

Many teachers mentioned being able to spend more time on aspects of writing linked to improved writing achievement and being able to build achievement in a cumulative way. For example, a typical comment from a teacher in a large urban school was, "We spent a lot of time building knowledge about words and playing with them and practicing them. We did a lot more talking about why we needed to know about words and making links between what we do in reading and writing. We did a lot more sharing of their writing and celebrated little improvements they made each time and then worked on what they would do next time to get better". A few teachers reported taking their group to places outside the school for writing ideas. However, further analysis of this approach is necessary to assess the benefits of spending travel time, which must have shortened the time for concentrated writing. Thus sharing time, systematic skills learning, and student 'ownership' of changes were evident.

A strong theme to emerge from the data was that the programme time was spent on focused learning and was seen by teachers as a key factor in successful learning. Daily interaction with a small number of students meant that teachers were more aware of even small changes in them. A linked success factor was that teachers reported more regular and specific feedback and feed forward to the group—more than was usually possible in a whole class.

It can be seen from the above findings that teachers were committed to student achievement success generally and we have outlined how teachers showed responsiveness to their students in broad terms through their reports of responsive teaching.

Here we report findings of how teachers used a range of more specific teaching approaches and strategies (or methods), usually established approaches to the teaching of reading and writing, that they adapted to suit the particular students. A number of teaching approaches or specific strategies of teaching, drawn from a best evidence synthesis (Alton-Lee, 2003; Anthony & Walshaw, 2009; Bishop & Berryman, 2006) and experience of literacy experts in the research team were chosen for inclusion in online surveys. Teachers were asked to rate the effectiveness of these approaches if they were in their teaching plans and were used in the additional learning. For reading teachers the most effective approaches were building connections between text and children's language experience, student-teacher conversations about a story, re-reading texts familiar to students, using personalised formative feedback, systematic work on phonemic awareness and using guided reading.

Particular changed approaches

Teachers were also asked to report the number of times that particular strategies were used and their effectiveness. In reading, the following approaches were rated as very effective by over two-thirds of the teachers: using personalised formative feedback, building connections between text and children's language experience, having conversations about a story and re-reading texts familiar to students. Not surprisingly, teachers used these approaches frequently. Writing teachers gave the highest ratings to the following approaches: 'modelled examples of good text', 'shared and valued student's writing', and 'worked with a small group'. Over half the writing teachers used these every day of the teaching, along with 'extending vocabulary' and 'made explicit links between writing and reading'. These approaches in reading and writing are indicative of focused learning that is likely to improve achievement.

How did teachers change for Māori students?

Reading and *writing* teachers reported that Māori students usually responded positively to the group teaching. The main changes teachers made, as mentioned previously, were adjustments by finding the interests of these students and making an effort to choose culturally relevant reading and writing topics and resources.

A strong emphasis across the literacy sample teachers was a view that effective teachers of reading and writing respond to the needs of their students by engaging in particular teaching strategies. Comments in surveys by the reading and writing teachers showed that many concurred with a teacher of reading who said that her approach to teaching the Māori students in the group was, "No different to other children". Another said, "I didn't alter my teaching approach. The National Standards were the same for all children but by knowing what they [Māori students] liked I was able to get them interested and eager to work. Through the children feeling safe and confident they achieved as well as the other students". The teacher's aim was to understand each student, a goal that is in line with the theory of culturally responsive pedagogy. It appears that these teachers were saying they taught the children the same way in general terms but because they got to know each student well—their characteristics, interests and so on—they were able to make adjustments to improve Māori students' engagement in learning. For example, a writing case study teacher said, "The five Māori students in my group really wanted to carry out a lot of discussions before doing the writing task and before I provided feedback and feed forward to other students. They liked critiquing the model piece of writing and questioning why it works. They shared that this is not the way their classroom is set up". This was something the teacher did not normally do (have extended discussion). But it results in better learning. Achievement data show that all five students made very good progress in the group.

Several writing teachers described how they involved Māori contexts in their writing group. One said, "One of the lessons and subsequent activities included a report on family in relation to mihi (greeting). We looked at tribes and engaged the assistance of families. The Māori students' sense of pride and belonging appeared to increase and the families took a greater interest in what the students were writing about".

How did teachers change for Pasifika students?

Teachers reported that Pasifika students usually responded positively to the group teaching. Several teachers mentioned that they were able to give the Pasifika students more individual attention than they would get in their usual class that was much larger. Reading teachers chose books the Pasifika students could relate to and use their personal experiences in discussion of the story. One said, "I was thrilled with the progress they [Pasifika] had made with their reading". Another said, "I chose books that the Pasifika students could identify with and this worked out well for the rest of the group, too".

Writing teachers cited similar changes to their teaching. Most comments were of attempts to build Pasifika students' confidence in believing they could improve their writing generally and specifically by reading their written work to other people, such as their own group, the principal and even to school assembly in some cases. A teacher with one Samoan child altered her teaching to support this student by: "I used examples of writing from Samoan writers and within the student's Samoan context". Interest and achievement went up as evidenced by work samples and teacher judgement. A number of teachers described how they learnt some words and phrases in the relevant Pasifika language to use in the programme group, such as greetings and substitute words. According to some teachers, Pasifika students seemed to find the group setting conducive to sharing with the teacher, something they often found difficult in a larger class. One teacher said, "I learnt a couple of basic phrases to greet and praise my Pasifika students. I focused on family experiences to build on and asked for their experiences within their cultural contexts such as traditions of building a waka (canoe) in Tonga. The students developed confidence that their contributions were valued and important".

Some teachers treated Pasifika as no different—in terms of general teaching approach—but made specific adaptations as shown by another teacher's comment: "Topics were all linked to something they had some experience of, for example, visitors to school, new gardens, Rugby World Cup". Thus the main teacher change was to have interesting writing topics relevant to each student's interests and cultural context.

Overall, evidence from reading and writing teachers showed that they were familiar with beliefs and practices of culturally responsive pedagogy. Most teachers were able to verbalise perceived advantages of knowing a student's family/whānau and ethnicity and interests and personality. Teachers said they used these practices as a general approach with all the children regardless of any particular ethnicity in conjunction with their usual specific teaching techniques. However, survey and interview evidence showed they made planned and on-the-spot adaptations for individuals. Thus knowing a student well was paramount to them and a key factor in culturally responsive pedagogy in the programmes.

Teaching strategies and student preferences and learning

Teachers and principals were committed to student achievement success generally and we have outlined how teachers showed responsiveness to their students in broad terms through their reports of responsive teaching. Here we report findings of how teachers used a range of more specific teaching approaches and strategies (or methods) usually established approaches to the teaching of reading and writing, that they adapted to suit the particular students. A number of teaching approaches or specific strategies of teaching, drawn from a best evidence synthesis (Alton-Lee, 2003; Anthony & Walshaw, 2009; Bishop & Berryman, 2006) and experience of literacy experts in the research team were chosen for inclusion in online surveys. Teachers were asked to rate the effectiveness of these approaches if they were in their teaching plans and were used in the additional learning. For reading teachers the most effective approaches were building connections between text and children's language experience, student-teacher conversations about a story, re-reading texts familiar to students, using personalised formative feedback, systematic work on phonemic awareness and using guided reading.

Student experiences of the teaching

An important aim of this evaluation was to get the reactions of students about their experiences in the reading or writing programmes. Students were asked *what they did with the intervention teacher that was different from what they usually did in their reading or writing in the classroom.* Out of 421 writing student responses, 88 said they did more or different things related to the strategies and skills of writing; one said, "[the teacher] helps when I start to waffle in my writing and gives me advice and supports me". Another said, "I learn about verbs, adjectives and nouns". Using different artefacts and materials was mentioned by 71 students, for example, one said, "I have been writing speeches and saying it in front of the whole class and making a video of the speech and watching it on the data projector". Fifty students said they wrote much more in the group and so got better at writing. Generally, students seemed to like having the chance to do more of what they liked and, importantly, what was helping them, working in a small group, discussing their writing with peers and teacher, having a structured writing programme, writing about topics relevant to them, working one-to-one with the teacher and being expected to achieve high standards in their writing. The responses across these students showed that most could articulate what was good for their own learning and the next steps needed.

Teachers mainly used their usual teaching approaches to teach reading or writing. However, it was clear that teachers changed how they utilised these approaches with the group, such as allowing more time for discussion and giving greater choice of topics for writing. Students were asked what they liked doing when working with the intervention teacher and what the teacher did to help their reading or writing. Of interest was whether they did different 'things' with information technology (IT) and whether these helped their learning. Of 114 useable reading student responses (out of 122) about a third could not say what was different (it should be noted that the children were young—aged 5-7 years). However, the remainder had some comments, the most frequent being: able to read more books than usual: "I can read three books each time instead of just one [in the usual class]", the teacher has "more time to listen to us read to her", and "we spend more time using a dictionary", and other comments about very specific things, such as those that follow about help with reading.

Knowing how strategies

When asked what the teacher did to help their reading, most students—including the younger reading students—could articulate what we called '*knowing how strategies'*, that is techniques of learning reading and/or writing. The most frequently mentioned by reading students were sounding words and letters, word power work, alphabet work, listening to other students read, doing homework, word meanings and being tested. Some thought reading more every day helped as did having lots of books, reading some books a number of times and being expected to read quietly to concentrate.

The most often mentioned aspects of teacher help in 421 writing student responses (by 143 students) were using sentence starters, using a wider range of vocabulary, how to write poems, how to make stories more interesting, re-crafting a story, using a dictionary or thesaurus, proof reading and many more. These responses show that many students had a realisation of the need to improve specific aspects of their writing and they got satisfaction from learning the skills of writing. One said: "We work and add detail to our writing together. Using precise verbs and more complex sentences to make my writing more interesting". Over 80 students enjoyed writing about different topics and the same number liked discussing the topics with peers and the teacher before beginning to write. Many said they liked sharing completed stories. Over 70 reported that they liked using resources to help them formulate ideas for writing and cited a wide range, such as pictures, computers, books, wall charts of vocabulary and many more. Other aspects that gained between 20 to 50 mentions were being able to use their own ideas in writing and being encouraged to build on their prior knowledge; feeling good about getting better at writing, liking the learning tasks the teacher planned, working in a small group, working one-to-one with the teacher and satisfaction from helping other children develop their writing.

Synergies across teacher and student views of effective teaching

From these student reactions to the teaching and learning, it can be inferred that they were positive about the learning activities that seemed to be the sort that students would normally do in their regular class but students liked the focused time and attention from the programme teacher. This is indicative of responsive teaching; the teacher got to know the students well and responded to their individual learning needs. The views of students interviewed across case study schools were consistent with the above survey views from the whole student group. Students were generally positive about their programme teacher, a view that is consistent with principals' views and self-report teacher views.

3.6 Provision of professional learning support

Part of the model for the programmes in reading and writing was that schools should support the teacher selected to teach the programme. Before the programmes began, three-quarters of the principals across all reading and writing schools said that teachers would have their teaching supported with professional learning and development and that subsequently proved to be the case. It was seen by principals as a school responsibility to provide support.

A collective responsibility

There was evidence that principals and programme teachers had a sense that because the school was able to take advantage of being allocated teacher time, there was an obligation to work hard to make the opportunity a success. A key associated factor was that principals and teachers were briefed at planning days and made aware of programme expectations outlined earlier. Principals were encouraged to ensure that programme teachers were supported by colleagues in their planning and teaching and to disseminate programme benefits across a school.

Overall, support for the programme teacher was an important part of programmes. It was reported earlier that increased scores in reading text levels were statistically related to more active principal involvement in support, either by actually providing the support or initiating support from others. Teachers who were interviewed in case schools thought that support had been essential to students' learning success.

Practical support for the intervention programme

Post-programme teacher and principal survey results showed that there was a high level of support for teachers. Reading teachers reported that their *main* support was from the principal (n=12 of 23 teachers), curriculum leader (n=3) in-school colleague (n=14) critical friend from outside the school (n=5) external advisor (n=11) (some gave more than one main support). The most *useful* support was 'principal' (n=3) 'in-school colleague' (n=6) and 'critical friend from outside the school' (n=4). As reported earlier the provision of professional support by principals was related to greater achievement in text reading levels in reading, illustrating the importance of support.

Writing teachers: Three of the 73 did not seek support, 41 chose 'principal', 33 chose 'curriculum leader', 47 chose 'in-school colleague', seven chose 'critical friend from outside the school', and 24 chose 'external advisor'. The most useful support was 'in-school colleague' (n=22) 'external advisor' (n=15) and principal (n=8).

Literacy case study schools: In all 15 case study schools support was provided to the programme teacher. Internal to the school, most principals were actively involved in coordinating the support by organising regular meetings of key personnel, such as deputy principals, lead teachers in literacy and sometimes a Reading Recovery teacher who worked with the programme teacher. In the case study reading schools, most teachers were supported by a Reading Recovery teacher from within the school. In some cases the programme teacher was also the Reading Recovery teacher. In the school with ELL, the teacher worked with another teacher and the classroom teacher to coordinate a programme that linked language learning with reading and writing.

Teachers mentioned a range of *external support* that was endorsed and sometimes initiated by the principal. In the literacy case study schools external support included literacy advisors, RTLB and other external consultants. One school combined with another to share the cost of an external consultant. In another school the teacher, lead teacher and principal were able to talk with school literacy advisors.

Support for teachers is an important part of *sustaining* the positive effects of these reading and writing programmes.

3.7 Sustainability of positive programme effects

The issue of whether any student gains in learning would be sustained beyond the programmes is of major education policy importance. Comments of principals and teachers in the surveys of the whole group and interviews in the case study schools showed that it was also a major consideration for the leaders in these programme schools. Principals and teachers could see that once a programme finished, the amount of any student achievement gains might reduce unless steps were taken. Consequently, leaders in many schools in the whole group decided, while the programmes were running, to link programme teachers to other teachers for planning, assessment and teaching approaches, that is, usually at least one other teacher worked closely with the programme teacher. Also, principals found ways to spread what was being learned more widely in the school. Most principals were exploring internal structures and practices to maintain and disseminate the positive impacts after the programmes finished.

More detailed information came from case study schools. All case study schools were investigating this matter on a school-wide basis. For example, the principal of a large school with a high ratio of Pasifika students and several groups of writing students commented, "The whole approach [the writing programme] was very successful and worked well for all our teachers. We have seen significant and good gains made by teachers and students, so are keen to integrate this approach into our 2012 annual plan". Most schools also reported that they would continue to monitor the progress of the intervention students in future. Financial concerns were a consideration, in particular, how to pay for teacher release time if that was needed. On the other hand, case study teachers and principals reported that sustaining the impetus of programmes was not solely a financial issue; rather, it also related to the ways students are taught and grouped for learning in their usual classroom where a teacher cannot focus exclusively on one small group but can learn better techniques of teaching groups. In addition to case study schools where it was possible to get more detailed response, in the survey responses from the whole group there were comments from numerous principals about the need to embed the changes in teaching of the programme students into the classrooms of other teachers.

Opportunities for teachers to share their learning

As already indicated, one of the goals of the programmes was that teachers would share their experiences with other teachers and so spread any positive influences more widely across a school. In post-programme surveys all but five of the principals of the reading and writing schools (total n=64 returns) reported that the intervention teacher(s) had shared ideas about the intervention with other teachers. Nearly two-thirds (64 per cent) said the sharing had positively influenced other teachers across the school, 56 per cent said it had positively influenced teachers in particular syndicates, 47 per cent said there was a positive influence on students in the classroom of the intervention students and 23 per cent thought there was also influence on students across the school. Principals were asked to indicate which of several statements was most applicable to their school in terms of the influence across the school. Nearly half of the principals believed that the reading or writing programmes had positively influenced children's motivation in these literacy areas across the school. According to a third of them, teaching of reading and writing was becoming better linked to children's learning needs.

At the end of the programmes three-quarters of all the reading teachers said they had been engaged in some sharing of the programme and one-fifth rated the sharing as 'a lot'. All of the writing teachers said they had shared their experiences; 40 per cent thought they had done a lot of sharing and 60 per cent had done 'some sharing'. Many principals and teachers across the whole group indicated an intention to continue the sharing beyond the programme.

Effects on usual classroom and school

Did the programmes impact the regular classroom of the programme teacher? There was evidence from surveys that most programme teachers had thought about how they could apply approaches they found to be successful with the group in their regular classrooms. Many teachers reported group approaches, such as more frequent and specific

planning, more student-teacher discussion about aspects of learning to read and write, more frequent and regular record-keeping of student achievement, techniques of group teaching and more use of specific feedback.

Interviews in case study schools revealed that there were positive effects upon programme students' usual classrooms. All case study schools organised a collaborative approach to planning the programmes by linking the programme teacher to a literacy lead teacher or other mentor and they usually involved the classroom teacher in what the students were doing in the programme and how they were progressing. Often, discussion was held on how the classroom teacher could build on the group learning by making alterations to the specific student's learning activities. There were examples of programme teachers who worked in a syndicate of several teachers reporting to the group and suggesting ways to change class activities.

These examples show that schools had individual ways of ensuring wider benefits. In one large school the teacher was being trained as an ongoing resource teacher to advise other teachers beyond the intervention. Another large school intensified ongoing support for classroom teachers by pairing teachers: one teacher to work with another to deal with the teaching of underachieving students. Some schools were planning to link success to professional learning provision and in one school plans have been made to sustain the gains into 2012: "The work completed by the two [programme] teachers is being spread to other staff through their action research. The Board of Trustees has recognised that the successes achieved need to be followed up in programmes and PD in 2012. Other teachers have been very keen to learn the reasons for the improved achievement and engagement".

Some principals stated that sustainability would be helped because of what teachers had gained in terms of their own change. One argued that among the school's teachers there is, "A greater understanding of acceleration, what and how this can be achieved. Teachers are more aware of the rates of progress and the need to intervene earlier [in their usual classroom]".

All but four of the reading and writing school principals (n=66) who responded believed that the intervention was successful enough to invest in sustaining it in the future for other students although the question did not ask for details of how this might be done. In summary, most principals saw benefits from the programmes that would influence teaching and learning across the school and had taken steps to sustain what had been learnt.

3.8 Findings from the programmes in reading, writing and English Language Learners (ELL)

This evaluation looked at the extent to which 10-week reading and writing programmes accelerated learning. When the various sets of data on student achievement were scrutinised there was a consistency across them. Student achievement data from overall teacher judgement and test scores, survey responses from principals, teachers and students and interviews with these three groups from case study schools indicate beliefs among these groups that student achievement would accelerate more than usual. There was confidence and expectations among principals that the teacher release time, backed up by time for planning and preparation, would improve student learning. Teachers, too, expected that their intensive teaching of a small group would improve progress in reading or writing. Students were also generally positive about their learning experiences in the programmes and believed that their achievement had improved.

Conclusions from student achievement data

These positive views were largely borne out by the before-after achievement data in reading and writing. Mean scores across the whole student population and across the three ethnic groups New Zealand European, Māori and Pasifika showed that the majority of students accelerated their learning in terms of the definitions of accelerated presented

above. In the two ELL schools, student achievement in reading and writing was accelerated and the extra teacher release time was beneficial in helping these schools coordinate programmes that integrated English language learning and reading and writing by forming a small teacher team to focus on a group of students.

Achievement data show that the three ethnic groups that were of key interest in this evaluation all made progress when measured by changes in group means. By the end of Term 3 the writing achievement of the three major ethnic groups (New Zealand European, Māori, Pasifika) had improved, on average, by at least one level on the asTTle test. Overall Teacher Judgement showed that all three ethnic groups improved in relation to the National Standards.

In reading achievement all three ethnic groups started at slightly different achievement levels and all significantly improved their scores at about the same amount for concepts about print, vocabulary, letter identification, word recognition and hearing and recording sounds. On instructional text level all three ethnic groups improved significantly: 70 per cent of Year 1 students improved, on average, by 4 sub-levels and over 90 per cent of Year 2 improved, on average, by 4.9 sub-levels. Overall Teacher Judgement was that about two-thirds of the students overall and in each ethnic group accelerated their reading.

Students taught in longer—over 30 minute—lessons improved significantly more than those in shorter lessons; and the students of more experienced teachers (10+ yrs of teaching) improved significantly more than those taught by less experienced teachers. However, caution is needed with these results owing to the small samples for years of experience.

When judged by group means both reading and writing scores were accelerated across the assessment measures.

Programme implementation models

This evaluation investigated how school leaders organised the reading and writing programmes in a school. There were two main organisational forms or models developed in schools. Model one was where students from one or more classes were withdrawn from their regular classrooms and worked in a designated space. In Model two students from one or more classrooms were taught in their regular classrooms. In most schools one teacher taught between four and eight students as a group; students were taught individually in fewer schools. The particular teaching arrangements varied; the teacher of the intervention was sometimes the students' regular teacher and sometimes not. In some schools the principal chose two teachers to work with a small group each and a few schools in writing had more than one group each taken by a different teacher.

At the programme teacher level there were several approaches to planning the programmes. Most teachers kept extensive records of their overall planning and, as the programme proceeded, regularly kept records of modifications to plans, reflections on their own teaching and formative assessment of students' work. The information—especially formative assessment—was often shared with a student's regular teacher and lead teachers played an active role in fostering this communication, as well as in making sense of the information.

In all schools a student's family/whānau were informed of the additional learning involvement of their child. Data showed that, overall, teachers found parents/whānau supportive of the opportunity of additional help with reading or writing. There were examples of schools where parents were free to visit and talk to teachers about the learning and most teachers sent work samples home or asked parents to engage with their child in activities, like listening to them read. Case study school teachers and children reported an increase in reading to others at home, including reading the written work done in the writing group.

Although we tested for statistically significant relationships between organisational and teaching factors and student achievement, there were only two significant factors. Students whose lessons were longer than 30 minutes improved significantly more during the intervention than the students whose lessons were less than 30 minutes. The students of more experienced reading teachers had higher achievement scores.

Pedagogical approaches

How teachers taught was of major importance. There was a strong commitment by teachers and principals to make the programmes effective, coupled with a prevailing view that the intervention was an opportunity too good to miss out on. The main motivation by principals to include their school was the chance to improve the reading or writing of underachieving students. Teachers used a variety of teaching approaches, including careful and responsive planning, high expectations, detailed record keeping, frequent teacher-student and student-student interaction and ongoing assessment and feedback. Teachers were able to focus their full attention on the programme students. In many schools programme teachers were required by the principal to regularly interact with the class teacher about what teaching approaches were effective and what the classroom teacher could do to build on programme experiences.

Strong encouragement was given to teachers in planning days prior to the programmes to use teaching that was *responsive to students' needs* and, in particular, to practise *culturally responsive pedagogy*. Most teachers showed they were able to describe aspects of their own teaching that are associated with practices that are responsive to student cultural/ethnic characteristics and needs without necessarily being familiar with the term 'culturally responsive pedagogy.' Most teachers reported that they taught much the same as they usually did but made adaptations that better suited the particular students. That is, they responded to the particular needs of their students in reading and writing by emphasising some aspects, like letting their student-writing group have more discussion about a writing topic—to prepare for the writing task.

Māori and Pasifika students

Teachers had mixed views about how much they changed their teaching approach to better suit Māori and Pasifika students in their groups. On the one hand, a lot of teachers reported they intended to teach all students in the group in a similar way, including any Māori and Pasifika students. They claimed there are certain basic teaching approaches for all and that any changes were specific to individual students rather than students as members of a particular group. On the other hand, it was clear that they meant this in general terms because many teachers reported how they had, indeed, changed specific aspects, such as letting each child choose writing topics that interested them and choose more relevant reading books. They changed their approach to respond to the individual student.

Student experience

What were the reactions of the students to the teaching? Nearly all students reported positive experiences in the additional learning work, including Māori and Pasifika students. Many could identify activities they did in their groups (or with the teacher in some reading and writing settings in regular classrooms) that helped their reading or writing. Some reported activities that were different from their usual class,= but these were not really fundamentally different. The way students reported their experiences showed that it was common for teachers to put more emphasis on some aspects, like reading more books in reading or sharing more of their written stories in writing; use visual tracking charts of achievement growth; and to put less emphasis on criticising and 'put down' comments that damaged confidence. Many students were able to identify particular strategies and learning skills that had been emphasised in the additional learning and say how they had helped their reading or writing. The skills were not usually new; rather they were given more emphasis, like systematically building vocabulary for use in writing. There was evidence from students that these kinds of teacher changes had helped their learning. Many gave examples of learning improvement, like writing more interesting stories and being able to read higher-level books.

In addition to achievement by test scores, the teaching approaches brought about associated changes in students' attitudes to learning reading or writing. Surveys and interviews showed that most became more positive. Their enjoyment of reading or writing rose, they were more confident and engagement and motivation grew. In case studies most students liked their programme teachers and there seemed to be a link between this and the motivation to do well.

Support for teachers

Principals generally took responsibility for the provision of professional learning support for the reading and writing programme teachers. They usually arranged for the lead literacy teacher to play a role, such as mentoring the teacher. They often took steps to ensure teachers shared their experiences with other teachers, although the extent of the sharing varied. Most teachers in the whole sample reported that the support was effective, especially from lead teachers, principals and Reading Recovery teachers for reading teachers. There was also some effective support from outside the school, such as literacy consultants and advisors. Most writing teachers in the whole group reported using more than one source of support, mainly principals, an in-school colleague or external advisors.

Teachers were also supported by attending pre-programme planning and training days. Many reported that they were expecting to be given specific instructions about the teaching of reading, writing and ELL students. They found this was not the case; instead there was encouragement to be confident in their own successful teaching approaches and to adapt them to the needs of the additional learning students. During their teaching, as evidenced in case study school interviews, all teachers seem to have grasped the opportunities the high trust approach allowed them, that is, to use their own initiative in their teaching approach.

Sustainability

All principals who took part in data collection were convinced about the worth of the programmes and many were looking for ways to provide some forms of extra teaching in their school, even without Ministry of Education funding. However, most reported that it would be difficult to run programmes like these interventions without Ministry of Education funding, especially since the cost of teacher release time was a major factor. Having realised that most students' reading or writing seemed to be improving as the programme was underway, principals were positive about sustaining the learning. All case study school principals had either already begun to widen the impact across a part or all of the school or had plans to continue to explore ways of achieving a wider impact in the school in future. Staff meetings and teacher syndicates had already been a vehicle for influencing other teachers across the school in terms of changing their classroom teaching to help students who are below learning expectations.

Across the whole group, many principals reported—in survey responses—that they were looking at ways to sustain effective changes to teaching that did not require additional Ministry of Education funding. For example, many had plans to extend the programmes across more teachers either school-wide or in teacher groups.

Concluding comments

In summary, the findings represent a reasonably consistent 'picture' across various sets of data. On the whole, principals and teachers showed a high level of confidence that the programmes in reading and writing would result in accelerated learning for many students. That confidence remained at the end of the programmes and was consistent with the measured achievement of the majority of students. Students, too, were mainly positive about their experiences in the additional learning programmes. They believed their attitudes had become more positive towards reading or writing and their own achievement had improved, beliefs that were supported by the achievement data of the majority of student, teacher and principal data.

Overall, the evaluation of the reading and writing programmes found a high level of consistency between the various sets of data that were collected. The information from principals indicated that they expected the programmes to increase student achievement and that programme teachers would be carefully selected and given support. Teachers believed that many students had increased their learning more than usual and it was brought about by careful planning and focused teaching of a group. These views were consistent with the higher than usual achievement of the majority of students and their more positive attitudes towards reading or writing.

Recommendations

From this evaluation it appears there are success indicators that should be considered in any future interventions or within schools. Principals need to take a key leadership role in organisational matters, the provision of teacher support and resources, teacher and student selection and in spreading benefits from programmes to the wider school. Experienced, expert teachers should be selected and they should teach a programme at least four times a week in lessons of more than 30 minutes. Groups seemed to achieve more when taught in a separate space from their usual classrooms; the programme teacher needs to interact with the classroom teacher of each student. Planning by teachers for a group needs an overall plan, supplemented by daily plans. Students reacted positively to enthusiastic, experienced teachers who planned learning experiences that responded to students' interests, backgrounds and abilities. Effective teachers had high expectations, systematically taught content and learning skills and gave regular feedback. It can be assumed that these success factors impacted in similar ways on Māori and Pasifika students because they increased their learning at a similar amount to all other students.

4. The Accelerated Learning in Mathematics and Specialist Mathematics Teachers programmes

4.1 Introduction

In this section we present the results of the evaluation of the Accelerated Learning in Mathematics (ALiM) programme and Specialist Mathematics Teachers (SMT) programme in 146 primary schools. Results come from the sets of data described in Section 2—student achievement data; survey data from principals, teachers and students; and interviews of principals, teachers and students in case study schools. Results are organised to show change in student achievement, what teachers did to influence this and how students reacted, along with how teachers were supported in their efforts to raise student achievement, especially that of Māori and Pasifika children.

The programmes had the following structure:

- ALiM: 5-12 students with learning needs where a short-term boost/acceleration of learning over 8-10 weeks would be of benefit. Teachers were to be effective classroom teachers with good understanding of mathematics pedagogy and cultural responsiveness. Schools were given 15 days teacher release and provided with 20 hours of professional development from an external advisor to support planning, preparation and reflection for teaching and learning. They were required to lodge student PAT Mathematics and NumPA data on the NZCER and nzmaths websites, respectively. Teachers were asked to keep a reflective journal.

- SMT: Students who were achieving 'well below' the National Standards and who required longer-term support and interaction with a teacher with specialist knowledge and expertise of mathematics teaching and learning. Teachers were to be highly effective and culturally responsive with proven ability to accelerate learning. Schools were provided 0.5 FTE for 15 weeks and 40 hours of external support. They were required to lodge student PAT Mathematics and NumPA data on the NZCER and nzmaths websites, respectively. Teachers were asked to keep reflective journals.

A key aim of the evaluation was to find the extent to which student learning was boosted and/or accelerated to the expected level and what supported this improvement.

4.2 Changes in student achievement

This sub-section presents an overview of student achievement. The student achievement measures used were; (i) PAT Mathematics data from the beginning and end of the programmes (ii) NumPA data from the beginning and end of the programmes.

ALiM Programme Student Achievement

Student Achievement Change: Progressive Achievement Test (PAT)

Student pre- and post-PAT scale scores were compared to assess changes in students' achievement. Changes were compared across Year levels and ethnicities (ie, New Zealand European, Māori and Pasifika students). We also calculated the percentage of yearly growth for each student and compared the average percentage growth across

different ethnicities. Analysis of variance (ANOVA) and the accompanying Bonferroni post-hoc test were used to test the statistical significance of difference between means (eg, pre and post intervention) had a mean value of zero.

ALiM Programme student respondents

The full group of ALiM students with PAT maths data consisted of 559 students. Of these, 39 per cent were Māori (39 per cent) 30 per cent were New Zealand European (30 per cent) and 23 per cent were Pasifika (23 per cent). Details of the sample demographics for the entire group are reported in Table 4.1 below. The majority of students were in Years 4, 5, and 6.

Table 4.1: Number of ALiM with PAT data students in each Year level by ethnicity and gender

		New Zealand European		Māori		Pasifika		Asian		Other		
		F	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**TOTAL**
Year	4	32	29	36	32	16	17	1	2	11	6	**182**
	5	25	16	31	31	23	17	2	1	6	8	**160**
	6	19	13	18	17	22	18	2	0	4	3	**116**
	7	8	9	18	13	3	4	0	1	0	0	**56**
	8	6	11	11	9	3	3	0	0	1	1	**45**
TOTAL		**90**	**78**	**114**	**102**	**67**	**59**	**5**	**4**	**22**	**18**	**559**

Note: Only New Zealand European, Māori and Pasifika students were used in the detailed analyses.

F = Female, M = Male

Year level and student achievement

As Table 4.2 indicates, students at all Year levels in the ALiM programme can be claimed to have made accelerated progress over the 10-week period of the programme, as measured by patm and percentage of yearly growth. (Note: Scale scores in patm units represent raw test scores converted to a location on an equal-interval scale so that students' amount of progress can be compared between different groups of students, over time for the same student, and for students at different Year levels.) The average growth, as measured by patm scale scores, differed by Year level [$F(4, 505) = 3.83$, $p < 0.01$] and a post-hoc test confirmed that the average growth was greatest in Year 4, with this being significantly greater than that in Year 5 [$p < 0.01$]. Scale score growth in the other years was not significantly different from that in Year 4 although the growth in Year 7 was also substantial. One explanation for the reduced rate of growth in Year 5 could be, as the New Zealand Curriculum and the mathematics National Standards signal, a move in expectation from early additive thinking to advanced additive and early multiplicative thinking, which is known to be a substantial challenge (Young-Loveridge, 2008).

The *percentage of the yearly growth* also varied across the Year levels but the only significant difference was between Year 5 and Year 6 [$p < 0.01$]. The high percentage of yearly growth in Year 6 can be accounted for as an artefact of the low 'norm' for the Year 6 percentage rate of growth but nevertheless it does suggest that the programme was particularly successful for this Year group. The growth in Year 7 was also substantial, as measured as percentage of yearly growth, the 10-week programme having achieved more growth in 10 weeks than might have been expected in a year.

Table 4.2: PAT: ALiM students' growth in patm scores in Year 4–Year 8

Year level	Number of students	Average initial scale score	Average growth (patm)	Yearly growth in norms[1] (patm units-2009)	Percentage of yearly growth (per cent)
4	182	24.74	7.39	7.7	96
5	160	33.21	5.19	6.2	84
6	116	38.22	5.66	4.5	125
7	56	42.85	6.16	5.4	114
8	45	45.64	4.44	5.6	79

Note 1: The difference in successive yearly norms were taken from Darr et al. (2009).

Ethnicity and student achievement

PAT achievement data for all students (559) and for the New Zealand European (168) Māori (216), and Pasifika (126) sub-groups of students is reported in this section.

As can be seen in Table 4.3 below the average increases in patm and percentage yearly growth were substantial for all groups. A two-way ANOVA using all data revealed that the magnitude of the change in *scale scores,* as measured by patm scores, from the start to end of the intervention was significant [$F(1, 558) = 397.79$, $p < 0.001$]. The change for each of the New Zealand European, Māori and Pasifika sub-groups of students was also significant, with the magnitude of change comparable for the three students groups, [$p > 0.05$]. Scatter plots of pre-intervention against post-intervention scale scores showed a relatively similar average gain across the ethnic groups, regardless of their initial achievement. That is, results indicate that the groups progressed by a similar amount.

Table 4.3: PAT: Mathematics scale scores (in patm units) for New Zealand European, Māori and Pasifika students in ALiM schools

Ethnicity	Average initial scale score (patm)	Average growth (patm)	Percentage of yearly growth (per cent)
All	33.46	6.03	99
New Zealand European	34.60	5.12	81
New Zealand Māori	33.46	6.74	113
Pasifika	32.88	5.95	100

An analysis of progress for each sub-group follows.

New Zealand European students: The effect size for the New Zealand European sub-group was medium (Cohen's d = 0.45). An effect size greater than 0.4 over one year is considered to be above average for educational research and is taken to reflect a positive effect of innovation (Hattie, 2009). This indicates that the impact of the programme for New Zealand European students had been substantial, all the more so given the short timeframe.

Māori students: A one-way ANOVA on the *percentage of yearly growth* revealed there was a significant difference in how much each of the different ethnic groups improved, [$F(2, 507) = 2.97$, $p = 0.05$]. An additional post-hoc test revealed that Māori students experienced significantly greater progress when it was calculated as a percentage of expected yearly growth (113 per cent) than did New Zealand European students (81 per cent), [$p = 0.05$]. This was the only difference detected between the different ethnic groups.

The effect size for the Māori sub-group was medium (Cohen's $d = 0.60$) which is above average for educational research (Hattie, 2009). More importantly, this is well in excess of an effect size of 0.25 considered to be educationally and practically significant for minority students (Fashola & Slavin, 1998) indicating that the programme had been very valuable.

Pasifika students: The effect size for the Pasifika sub-group was medium (Cohen's $d = 0.61$). Again, this suggests an above average positive effect from the ALiM programme. The observed effect size values suggest that the intervention was similarly beneficial for Māori and Pasifika.

The medium effect size obtained for all three ethnic groups indicates that they all benefited significantly from the intervention, although in terms of exact values beneficial effects were somewhat greater for Māori and Pasifika.

Student achievement change in the ALiM case study schools (PAT)

There were nine ALiM schools in the case study school sample.

To assess whether the programme brought about *accelerated* learning across the students directly involved in the programme, we compared changes in student achievement between the start of Term 1 to the start of Term 3 with changes during the programme period from the start of Term 3 to the end of Term 3. Term 1 PAT: Mathematics data were available for only five of the case study schools, our sample consisted of 13 Māori and 19 Pasifika students. Although there were two New Zealand European students in this cohort, it was not possible to include them in the analysis in any meaningful way, so they were removed from it.

Results of the two-way ANOVA revealed a small increase in scale scores from the start of Term 1 to the start of Term 3 but this increase was not significant for either Māori students or for Pasifika students. Conversely, both Māori and Pasifika students experienced a significant and comparable increase in scale scores from the start of Term 3 to the end of Term 3 [$F(1, 30) = 33.20$, $p < 0.001$]. A two-way ANOVA revealed that the increase in scale scores during the programme was significantly greater than during the two terms prior to the programme, [$F(1, 30) = 4.58$, $p < 0.05$] and was of comparable magnitude for both Māori and Pasifika students.

In terms of the percentage of yearly growth, Māori students experienced a significantly greater change during the programme (134 per cent) than they had during the previous two terms (13 per cent) [$F(1, 12) = 6.67$, $p < 0.05$]. Pasifika students improved more during the programme (94 per cent) than they had in the previous two terms (72 per cent) but the difference in their improvement was not statistically significant. In considering these results it must be noted that improvement from the start of Term 1 to the start of Term 3, in terms of the percentage of expected yearly growth, was extremely low for Māori students.

In sum, although accelerated learning has been identified here, it is important to keep in mind that the acceleration of learning analysis was based on a very small sample size and all results should be treated with caution. This said, the case study teachers were emphatic that the students had made positive gains in both achievement and attitude.

Student Achievement Change: NumPA

The full group of ALiM students for NumPA data consisted of 642 students from 109 New Zealand schools spread across North and South. Of these, Māori made up 40 per cent of the group, followed by New Zealand European (33 per cent) and Pasifika (19 per cent). Details of the demographics for the entire group are reported in Table 4.4 below. In the full group, there were a similar number of male and female students (46 per cent and 54 per cent respectively); this ratio was fairly constant across the three ethnic groups. The majority of students were in Years 4, 5, and 6.

Table 4.4: Number of ALiM NumPA students in each Year level by ethnicity and gender

		New Zealand European		Māori		Pasifika		Asian		Other		
		F	M	F	M	F	M	Fe	M	F	M	TOTAL
Year	2	7	11	4	5	0	1	0	1	0	0	**29**
	3	11	14	14	12	9	7	0	1	5	3	**76**
	4	35	26	42	30	12	13	3	3	7	4	**175**
	5	25	18	36	27	15	14	2	0	5	6	**148**
	6	19	11	17	22	27	16	2	0	3	1	**118**
	7	8	11	16	10	2	2	0	1	0	0	**50**
	8	8	10	13	12	1	2	0	0	0	0	**46**
TOTAL		**113**	**101**	**142**	**118**	**66**	**55**	**7**	**6**	**20**	**14**	**642**

Note: Only New Zealand European, Māori and Pasifika students were used in the detailed analyses.

F = Female, M = Male

Judgements about acceleration

The Chi-squared goodness-of-fit test was used to assess if there were significant changes in students' achievement from pre- to post programme. Where appropriate, we used Kruskal-Wallis' test to assess whether, overall, New Zealand European, Māori and Pasifika students benefited equally from the intervention and the Mann-Whitney test to determine whether any two groups of students differed in their achievement. We also used the Wilcoxon signed-ranks method to test for differences between paired scores (pre and post intervention) for each group of students separately. Only students who identified themselves as New Zealand European, New Zealand Māori or Pasifika and for whom both pre- and post-intervention scores were available were used in the detailed analysis. Students who were coded '0' in the data set received from NZmaths were not included in the analysis (Neil & Hodgen, 2011).

Judgements about the extent of student progress against the numeracy stages were based on the findings of the Numeracy Development Project evaluations. In the 2009 report, Young-Loveridge (2010, p. 208) details student attainment of the different stages against Year level based on data from 2003, 2005 and 2007 for the Additive domain. In this report, data on student attainment in the additive domain is used to make comparative judgements. The concepts embedded in the Additive domain are fundamental to the other domains and to later student learning and therefore they provide a robust basis for making judgements about progress. Consequently, if the intervention students progressed more than Young-Loveridge reported in the Additive domain, it will be claimed that their progress is accelerated. It is important to note that the Numeracy Project reports detail findings for changes over the course of a school year (March to November, around 30 weeks) and so students making progress equal to that reported by Young-Loveridge can still be said to have made very good or accelerated progress. Numeracy Development Project findings are described at salient points in the analysis that follows to allow for ease of reading.

ALiM student progress across the Numeracy Framework stages

The following analyses were based on sub-samples of data (New Zealand European, New Zealand Māori & Pasifika students).

At the start of the programme, the majority (79-85 per cent) of ALiM students were identified as working at Stages 4 or 5 in addition and subtraction, multiplication and division, forward number word sequence (FNWS), and backward number word sequence (BNWS). In ratio and proportions, fractions, and basic facts the majority (61-71 per cent) of students were at Stages 2-4. In place value, most students were at Stage 4 (56 per cent). By the end of the programme the majority of students across all domains were at Stages 5 or 6 except in place value where there were a similar number of students at Stages 4, 5 and 6: between 58-85 per cent of students were assessed as at stage 5 or above across all domains. Comparison with Numeracy Development Project findings (Young-Loveridge, 2010), suggests that the distribution of the students, given a majority (60 per cent) were in Years 4, 5 or 6, had changed to better reflect the attainment achieved by their peers in the Numeracy Development Project projects.

Table 4.5 below indicates that, irrespective of their starting point and Year level, the majority of ALiM students made a gain of at least one framework stage during the 10 weeks of the programme. The remainder stayed at the same stage or, in a few cases (1 per cent) showed a drop in their stage level, which could be owing to a measurement or data entry error. Comparison with findings from the Numeracy Development Project indicate that students making a gain of one stage or more equates with them having made accelerated progress. Young-Loveridge (2006, p. 150) summarised the average changes between initial and final stages for students who began at Additive Stages 4 and Stage 5 for 2002, 2003, 2004 and 2005. Her analysis found that, on average, students who began at Stage 4 or 5 would be expected to move within that stage over the course of a year. Hence, an average stage change of one or more would constitute accelerated progress for a group, albeit that there will be considerable variability in individual progress. Given this, it can be seen that many of the students in the ALiM programmes progressed by more than what might have been expected had they participated in a normal classroom numeracy development programme.

Table 4.5: ALiM students stage change in the Numeracy Framework Domains

Numeracy domain	Increase 2+ stages	Increase 2 stages	Increase 1 stage	No Change	Decrease	Average increase in stages	Percentage of students advancing by at least one stage	TOTAL
Addition	7	86	333	167	1	0.88	72	594
Multiplication	6	92	260	151	3	0.90	70	512
Proportions	7	86	224	190	5	0.80	62	512
FNWS*	1	44	296	243	6	0.64	58	591
BNWS**	12	53	269	245	8	0.68	57	589
Fractions	29	150	229	111	4	1.17	78	523
Place value	23	179	225	152	4	1.11	73	583
Basic facts	32	118	253	19	4	1.08	75	536

Note 1: Table based on New Zealand European, Māori, and Pasifika students' data only.

Note 2: Following Neill, Fisher and Dingle (2010) for comparison purposes, we assumed that a decrease corresponds to a drop in one stage and that the increase 2+ stages corresponds to an increase of 3 stages.

* Forward number word sequence

**Backward number word sequence

As can be seen from the table above, the greatest average increase in stages was for the Knowledge domains of fractions, place value, and basic facts. The lowest percentage of students moving at least one stage was observed for proportions and ratios, BNWS and FNWS (Note: Stage 6 is the maximum stage on the Number framework for BNWS and FNWS). Fractions had the highest proportion (78 per cent) of students increasing in at least one stage. All other domains had a similar proportion (70 per cent-75 per cent) of students advancing at least one stage. An analysis of the teaching intentions produced during the Auckland and Wellington planning days indicated that most teachers planned to work on fractional number and place value and around half intended to focus on basic fact knowledge, which provides one explanation for student progress in these aspects. On the other hand, teacher survey and case study data indicated that teachers adjusted their intentions to meet the needs of their students (see Section 4.5) and so these initial intentions are unlikely to reflect in detail the nature of the teaching programme. It is perhaps of more interest that Table 4.5 indicates students made progress across all domains, which may reflect the interconnected nature of the constructs within the Framework (see Book 1: The Number Framework), so that direct instruction and student learning in one domain has a flow on impact in understanding in other domains.

Across all eight numeracy domains, students assessed at lower stages on the Number Framework at the beginning of programme, on average, shifted by more stages than students at higher stages. This pattern of change is consistent with Numeracy Development Project findings (Young-Loveridge, 2010). Generally, students who started at Stages 1 or 2 gained, on average, about two stages, students at Stage 3 gained, on average, more than one stage, students at Stages 4 and 5 progressed around one stage. These changes are broadly comparable to those reported in ALiM 2010 and the first ALiM programme in 2011.

These results indicate that schools had successfully identified students who would benefit from a short boost of support to master fundamental ideas and the programme had worked for them.

ALiM student progress across aspects of the Numeracy Framework by ethnicity

Analysis indicated that, on average, students across the three ethnic groups were at stage 4 of the Number Framework at the beginning of the programme and that they progressed to stage 5. In line with findings on stage changes detailed in Table 4.5 above, the average increase in stages varied across the different aspects of the Number Framework, with some variability across the sub-groups. Research associated with the Numeracy Development Project has consistently found that only two-thirds (63 per cent) of Year 4 and three-quarters (75 per cent) of Year 5 students attain Stage 5 (as indicated by the Additive domain) and so this result is positive given the students' starting point (Young-Loveridge, 2010). There was no pattern in the average stage change between pre-and post programme stage distributions for the three groups in relation to them having similar/different initial and similar/different final distributions.

To further investigate achievement gains and whether gains differed between New Zealand European, Māori and Pasifika students, we adopted the transformation of Number Framework stages into 'scale scores' developed by Neill and Hodgen (2011) in the *Exploring mathematics interventions* report. As argued by Neill and Hodgen (2011) scale scores capture the non-linearity of the Number Framework levels and account for the easier attainment of progress at the lower stages relative to the higher stages of the Framework. The scale scores are aligned with the midpoints of each stage as presented on the National Standards poster (Table 4.6 below is reproduced from Neil and Hodgen, 2011, pp. 3-4). For more information and detailed explanation regarding the transformation of Number Framework stages into "scale scores" and the theoretical and practical reasons behind it, refer to Neil and Hodgen (2011).

Table 4.6: Number Framework stages and assigned scale scores (p. 4)

Number Framework stage	1	2	3	4	5	6	7
Scale score	0.5	1	1.5	3	6	10	14

Student pre- and post-NumPA scale scores were calculated for each domain. A weighted average of pre- and post-scale score results was calculated for each group. The difference between weighted pre/post averages was equated with 'growth'. Growth scores could therefore be compared directly between student groups regardless of the stage they were at initially. Table 4.7 summarises findings on 'growth' for each of the three groups, which indicates that greater growth was observed in fractions, basic facts and proportions and ratios.

Table 4.7: ALiM student growth for each number domain (across ethnic groups)

Ethnicity	Addition & Subtraction	Multiplication & division	Proportions & ratios	FNWS	BNWS	PV	Fractions	Basic facts	Average growth
All	2.59	2.84	2.93	2.10	2.01	2.79	3.34	3.06	**2.71**
New Zealand European	2.39	2.64	2.39	2.01	2.38	2.80	3.22	3.07	**2.61**
New Zealand Māori	2.63	2.84	3.14	2.05	2.05	2.67	3.49	3.04	**2.74**
Pasifika	2.88	3.15	3.49	2.31	2.73	3.04	3.42	3.70	**3.09**

Note: There may be discrepancies in growth calculations owing to rounding.

As can be seen from the table above, Pasifika students consistently recorded the highest levels of growth as judged using NumPA domain scale scores. They also recorded the highest final average scale score for all domains except multiplication and division, irrespective of their initial average scale scores relative to the New Zealand European and Māori sub-groups. Although no statistically significant differences were identified, this suggests that Pasifika students as a group drew particular benefit from the programme.

Summary of ALiM student achievement change

On average, all students, including the New Zealand European, Māori and Pasifika student sub-groups significantly improved their achievement both in terms of growth in PAT scale scores (as measured in patm units) and in the percentage of expected yearly growth. The gains made were such that, on average, students from all groups can be said to have experienced accelerated progress in achievement owing to their participation in the programme. That is, they had made greater progress than would have been expected in the same time in a regular classroom programme. Analysis of the gains made by students in the case study schools for whom we had beginning of Term 1 and 3 and end of Term 3 PAT data add weight to the conclusion that ALiM accelerated the growth of the selected students' mathematics learning. The Year 4 students recorded the greatest change in PAT scale scores, indicating that the programme was of particular value to them. The Year 6 students recorded a slightly lower change in average scale score but the greatest change in percentage of usual yearly growth, suggesting the programme was particularly successful in giving the Year 6 students a boost, relative to their peers.

The NumPA stage data and NumPA scale score data also confirmed that, on average, all students, including students from each of the New Zealand European, New Zealand Māori and Pasifika sub-groups made progress equal to or greater than has been reported by the Numeracy Development Project evaluations for a school year (Young-Loveridge,

2010). The trend was for a majority of the students (at least 60 per cent) to move from Stages 4 or 5 to Stages 5 or 6. The pattern of change was that students who began at a lower stage on the Numeracy framework made a greater gain in stage change. The pattern for the PAT data was that students at lower Year levels tended to make greater gains, as measured by patm scale score and percentage yearly growth.

The Māori student sub-group data indicate that, on average, achievement had been accelerated. Māori students recorded the greatest change in PAT (measured in PAT units) scale scores. They recorded significantly greater gains, as measured by percentage of usual yearly growth than did New Zealand European students but not Pasifika students. The effect size for Māori students was significant and similar to that of Pasifika students and greater than that for New Zealand European students. NumPA data also showed that Māori students had experienced accelerated growth greater than would have been expected over the period of the ALiM programme.

As evidenced by change in PAT scale scores, percentage of yearly growth and effect size calculations, the achievement of the Pasifika student sub-group had also been accelerated. Pasifika students consistently demonstrated greater growth, as measured in average NumPA scale scores for each domain on the Framework, when compared with New Zealand European and Māori students.

A proportion of students at each Year level recorded a negative gain on PAT Mathematics, 120 in total. Often only one student from a school recorded this negative gain but there were 17 schools where there were between two and four students for whom this was the case. Fourteen of the 63 (21 per cent) Year 8 students, 16 of the 84 (19 per cent) Year 7 students, 28 of 139 Year 6 (20 per cent) students, 37 of 229 (16 per cent) Year 5 students and 25 of 223 (11 per cent) Year 4 students made a negative gain. This proportion is consistent with that reported by ALiM 2010 (Neill, Fisher, & Dingle, 2010). The relatively low percentage of students experiencing negative gains in Years 4 and 5 suggest that the programme is likely to have optimal impact with students in Years 4 and 5.

SMT Programme Student Achievement

Student Achievement Change: PAT Mathematics

As with the ALiM student data, student pre- and post-PAT scale scores were compared to assess changes in students' achievement.

SMT Programme student respondents

The Table 4.8 documents student respondents and indicates schools prioritised Years 4 and 5 students.

Table 4.8: Number of SMT PAT students in each Year level by ethnicity and gender

		New Zealand European		Māori		Pasifika		Asian		Other		TOTAL
		F	M	F	M	F	M	F	M	F	M	
Year	4	7	6	11	17	11	9	1	2	3	0	**67**
	5	22	20	15	18	7	4	1	3	2	1	**93**
	6	8	7	9	3	4	1	0	1	3	0	**36**
	7	1	4	4	8	5	7	1	0	1	0	**31**
	8	8	5	2	0	3	2	2	3	0	0	**25**
TOTAL		**46**	**42**	**41**	**46**	**30**	**23**	**5**	**9**	**9**	**1**	**252**

Note: Only New Zealand European, Māori and Pasifika students were used in the detailed analyses.

F = Female, M = Male

Year level and PAT student achievement

As can be seen from Table 4.9 below the average growth, as measured by PAT scale scores in patm units and percentage yearly change for SMT student achievement, can be claimed as accelerated over the period of the programme. This growth differed by Year level, with scale scores indicating growth was the greatest in Year 4 but not significantly different from the growth in Years 5, 6, and 7. The average growth in Year 4 was, however, significantly greater than that in Year 8, [$p < 0.01$]. There were no other significant differences in the progress students made across other Year comparisons.

In terms of the *percentage of expected yearly growth* students at Years 4, 5, and 6 made substantial progress in the timeframe of the SMT programme and can be said to have made accelerated progress. The higher level of Year 6 growth understood as a consequence of the low norm for growth in that year but nonetheless suggests the programme may well have been particularly effective for the albeit relatively small number of students at this Year level. The Year 8 students can also be said to have made accelerated progress but at a lesser rate, as was confirmed by the results of the one-way ANOVA. Table 4.9 summarises the results of this analysis.

Table 4.9: SMT student growth in patm scores in Years 4-8 in SMT schools

Year level	Number of students	Average initial patm score	Average growth (patm)	Yearly growth in norms (patm units)	Percentage of yearly growth (per cent)
4	67	21.39	7.29	7.7	95
5	93	32.48	5.47	6.2	89
6	36	34.60	5.57	4.5	124
7	31	39.88	3.66	5.4	68
8	25	51.00	2.49	5.6	44

Ethnicity and PAT student achievement

PAT achievement data from all SMT students and the New Zealand European, Māori, and Pasifika student sub-groups is reported here.

A two-way ANOVA using *all data* revealed that the magnitude of the change in *scale scores*, as measured by patm units, from the start to end of the SMT programme was significant [$F(1, 251) = 397.79$, $p < 0.001$]. Table 4.10 indicates that the average scale score increased by 5.45 patm units for the students as a group. Scatter plots of pre- against post-programme scale scores showed a relatively constant average gain in scale scores across the ethnic groups and across initial achievement scores. The average change was comparable for the three ethnic groups of students.

As can be seen in Table 4.10 below, students made considerable progress in the 15 weeks of the programme, equivalent to what might typically be expected in 27 weeks. Hence, in terms of percentage yearly growth student learning was accelerated.

Table 4.10: SMT mathematics scale scores (in patm units) for New Zealand European, Māori and Pasifika students

Ethnicity	Average initial score (patm)	Average growth (patm)	Percentage of yearly growth (per cent)
All	32.58	5.45	88
New Zealand European	33.47	5.57	93
Māori	30.73	4.33	68
Pasifika	32.76	5.71	86

A one-way ANOVA on the *percentage of yearly growth* revealed that each ethnic group (New Zealand European, Māori, and Pasifika) improved to a similar degree. Māori students experienced the smallest percentage of yearly growth, although their growth was not statistically different to that of the other two ethnic groups.

In terms of the impact of the programme, New Zealand European, Māori and Pasifika students experienced a similar effect size (d = 0.50 0.42 and 0.54 respectively). Drawing on Hattie (2009) these results point towards the moderate effect size. However, as Fashola, and Slavin (1998) have pointed out, an effect size of 0.25 is considered beneficial for minority groups such as Māori and Pasifika, which are viewed as minority groups.

Student Achievement Change: NumPA

SMT programme NumPA data were collected from students at the start and end of the 15 weeks of the intervention. We undertook the same processes and analysis as for the ALiM data. The student profile is shown in Table 4.11.

Table 4.11: Number of SMT NumPA students with NumPA data in each Year level by ethnicity and gender

		New Zealand European		Māori		Pasifika		Asian		Other		
		F	M	F	M	F	M	F	M	F	M	TOTAL
Year	2	1	1	5	2	1	0	1	0	0	0	**11**
	3	7	2	12	9	3	7	1	1	4	2	**48**
	4	13	10	16	20	12	10	1	2	2	1	**87**
	5	28	21	19	19	10	7	2	1	0	0	**107**
	6	15	13	14	3	3	3	1	1	1	1	**55**
	7	3	5	5	9	10	10	2	0	1	0	**45**
	8	5	2	3	2	3	3	0	0	0	0	**18**
TOTAL		**72**	**54**	**74**	**64**	**42**	**40**	**8**	**5**	**8**	**4**	**371**

Note: Only New Zealand European, Māori and Pasifika students were used in the detailed analyses.

F = Female, M = Male

SMT student progress across the Numeracy Framework stages

The following analyses were based on sub-samples of data (New Zealand European, New Zealand Māori & Pasifika students).

At the start of the programme the majority (61-87 per cent) of SMT students were identified as working at Stages 4 or 5 in addition and subtraction (80 per cent) forward number word sequence (FNWS) (79 per cent) and backward number word sequence (BNWS) (76 per cent). In multiplication and division (73 per cent) ratio and proportions (61 per cent), fractions (78 per cent), and basic facts (87 per cent). The majority of students were in Stages 2-4. In place value, most students were in Stage 4 (60 per cent). By the end of the programme 49-78 per cent of the students were at Stage 5 or above on each domain, with a majority of these students in Stages 5 or 6. The exceptions were place value (75 per cent), and basic facts (74 per cent) where the majority were at Stages 4 or 5 and basic facts and fractions, where most were at Stage 5 (60 per cent). Comparison with Numeracy Development Project findings (Young-Loveridge, 2010) suggests that the final distribution of the students, given the majority were in Years 4 and 5, was broadly reflective of the attainment profile of their peers in the Numeracy Development Project projects and represented accelerated progress in comparison with Numeracy Development Project findings. This progress is a substantive achievement given the students had been selected for the programme because they were well below the National Standard.

The majority of SMT students made statistically significant gains across all domains during the 15 weeks of the programme. The number of students who showed positive, no change, and negative change is detailed in Table 4.12. Based on the findings of the Numeracy Development Project, as described in the section on ALiM student progress, the majority of SMT students can be said to have made 'accelerated' gains because at least two thirds progressed at least one stage of the Framework. Given the Numeracy Development Project findings suggest that most students tend to shift half a stage.

Table 4.12: SMT students in stage change in the Numeracy Framework domains

Numeracy domain	Increase 2+ stages	Increase 2 stages	Increase 1 stages	No change	Decrease	Average increase in stages	Percentage of students advancing by at least 1 stage	TOTAL
Addition	6	63	246	83	1	0.97	79	399
Multiplication	4	63	174	99	2	0.95	73	328
Proportions	63	183	0	85	1	1.67	74	332
FNWS *	5	44	226	116	6	0.81	69	397
BNWS**	6	59	199	129	2	0.84	67	395
Fractions	6	72	155	87	2	0.98	72	322
Place value	13	87	149	116	4	0.97	67	369
Basic facts	15	89	161	76	3	1.10	77	346

Note 1: The table includes only New Zealand European, Māori, and Pasifika student data.

Note 2: Following Neil, Fisher and Dingle (2010) for comparison purposes, we assumed that a decrease corresponds to a drop in one stage, and that the increase 2+ stages corresponds to an increase of 3 stages.

* Forward number word sequence

**Backward number word sequence

Across all eight domains, students at lower stages, on average, shifted by more stages than students at higher stages. Namely, students who started at Stages 1 or 2 gained, on average, about two stages, students at Stage 3 gained, on average, more than one stage, students at Stage 4 gained about 0.9 of a stage and students at Stage 5 gained more than

half of a stage. These changes can be understood as reflecting the increase in complexity across the stages. They echo the pattern of progress found in the Numeracy Development Project.

SMT student progress across domains of the Number Framework by ethnicity

The mean scores of all students and each of the student sub-groups improved significantly from pre to post intervention on all components of the NumPA assessment as determined by Chi-square statistics. Looking across the eight domains, Chi–square tests indicated that, with the exception of place value and basic facts, the distribution of the student sub-groups across stages at the beginning of programme was significantly different. The nature of these initial differences varied but no pattern of difference was sustained into the post assessment.

To further investigate differences between the student sub-groups, scale scores were calculated using the Neill and Hodgen (2011) method detailed earlier. Results are presented in Table 4.13 below where it can be seen that, on average, each student group achieved a growth of at least two scale scores, which represents accelerated achievement, given the timeframe for the SMT programme.

Table 4.13: SMT student ethnic group scale score growth by domain

Ethnicity	Addition & Subtraction	Multiplication & division	Proportions & ratios	FNWS	BNWS	PV	Fractions	Basic facts	Average growth
All	2.69	2.87	3.2	2.28	2.23	2.35	2.66	2.35	2.58
New Zealand European	2.74	2.44	3.14	2.25	2.28	2.32	2.90	2.11	2.52
Māori	2.53	2.88	2.94	2.40	1.54	2.45	2.54	2.09	2.42
Pasifika	3.11	3.54	3.94	2.26	2.12	2.17	2.47	2.34	2.74

Note: There may be discrepancies in growth calculations owing to rounding.

New Zealand European students as a group made the most progress on fractions and BNWS. Māori students made the greatest progress with place value and FNWS. Pasifika students made the most overall progress as a group in the other areas. The growth results for addition and subtraction, multiplication and division, and proportions and ratios indicate that Pasifika students showed the largest growth, relative to the other two groups, and their end point average was the highest in these categories.

Summary of SMT student achievement change

All student groups in the SMT schools improved significantly during the programme as reflected through changes in PAT and average NumPA assessment average scores. The average progress of all student sub-groups was such that their learning can be claimed as 'accelerated'. As assessed through PAT data, students made more progress than would have been expected over a similar period in a classroom programme. With regard to the NumPA, the degree of student progress was greater than that reported as part of the Numeracy Development Projects (Young-Loveridge, 2010). There was some variation in student progress but there were no systematic differences between New Zealand European, Māori and Pasifika students.

On average, all students, including the New Zealand European, Māori and Pasifika student sub-groups, significantly improved their achievement both in terms of growth in scale scores, as measured in PAT scale score patm units, and in the percentage of expected yearly growth. As there was no difference in effect size for the three groups, all could be said to have made substantial progress. Pasifika students recorded greater growth in half of the domains in the SMT schools.

Overall commentary on student achievement gains

Overall, the programmes were successful in accelerating student learning beyond that which might have been expected in a similar period in a regular classroom programme. Students in Years 4 and 5, on average, demonstrated greater growth as measured by PAT data. The rate of change for all sub-groups on PAT was similar, irrespective of the distribution of their starting point, and so the programme raised student achievement overall but did not close any gaps in student attainment between the different ethnic groups. In ALiM the effect was similar for Māori and Pasifika students and greater than that for the New Zealand European sub-group of students.

With NumPA, the initial student sub-group stage distribution varied (some distributions were similar and some were not). There was no pattern of change to the final distribution. In ALiM, Pasifika made the greatest gain across all domains and finished the programme with the highest relative average domain stage score. There was no such pattern for SMT.

4.3 Perception of changes

Teachers and students were asked for their views of the impact of the additional learning programmes on student achievement and attitudes as mathematics learners. Both groups were very positive about the impact of the programmes on student achievement, confidence and motivation. These findings are reported in detail here.

Principal and teacher perceptions

At the beginning of the programmes, nearly all the ALiM principals (78/81) and all of the SMT principals thought that the children in the intervention programme would achieve more in mathematics than they usually would have in 10 weeks.

In the end of programme surveys, teachers reported that students had made more or much more than usual progress over the period of the intervention. This was the case for both the ALiM and the SMT teachers and across the three main student sub-groups. Added to this, 13 of 95 ALiM teachers thought that student learning gains would be maintained at the same level and 57 thought that gains would be maintained at a lesser level. Twenty-one were not sure and four ALiM teachers did not respond to this question. Of the 26 SMT teachers, five thought that student learning gains would be maintained at the same level, 17 that the gains would be at a lesser level, one teacher was not sure and three (12 per cent) did not respond to this question. Overall, these responses suggest that teachers expect the rate of gain made by students to be sustained, which is in line with the longer-term aims of the programme.

The *New Zealand Curriculum* (Ministry of Education, 2007) aims to develop all students as confident, connected learners and knowers. Promotion of positive student attitudes towards mathematics is thus a legitimate and worthwhile aim for mathematics education. This is especially the case in the intervention where the goal is for sustainable growth in students' mathematics knowledge and mathematics learning capacity. Around half of the ALiM teachers reported 'much more' than usual shifts in student enjoyment, motivation and engagement and the rest reported more than usual change. Just under two-thirds of the ALiM teachers considered their students had experienced substantial shifts in their confidence.

Similarly, all but one of the 26 SMT teachers reported students increased their levels of enjoyment, motivation and engagement in mathematics. Around two-thirds of teachers reported much more than usual change. Most (85 per cent) of the SMT teachers reported much more than usual shifts in student confidence.

These results are very positive but need to be treated with some caution because 40 of the 95 ALiM teachers and 16 of the 19 SMT teachers did not teach their regular class students. These teachers were therefore only able to make a

limited comparative judgement about the extent/rate of change in student attitudes. This said, survey and case study interview comments reiterated that many teachers saw students gaining confidence as a substantive and important outcome of the programme. In particular, a number of teachers commented on an increase in student "confidence to talk about their learning", often in conjunction with the comment that students' willingness to take risks had increased. Teacher commentary indicated that this confidence extended beyond working in the mathematics group and into their regular classroom programmes across the curriculum as the following examples illustrate.

> Case study teacher 10 explained that all her children had progressed in their understanding. The child who had made least progress had been away for two weeks. What she did in the intervention group had complemented what she did in the classroom and the children's confidence has increased right across the curriculum and not just in mathematics.

> Biggest improvement was in the students' confidence and self-belief. They just needed time to process a few things and then progress was significant.

> I personally believe that although the results of the data may in some cases show that these children haven't made significant progress, I can personally see significant changes in their attitude towards learning in the class. Other staff members have been shocked at what they have seen with some of these children. For example the boy who cried when asked a question and struggled to count on to solve addition problems like 8+7= stood in front of the whole class with his group and taught the class how to solve 124 x 2. All of these children are confident at using their voice in class now and quite often correct others. I really enjoyed taking part in this programme even though at times I despaired that the children may not be learning anything. Some concepts took a long time for the children to grasp and required a lot of repetition.

Student perceptions of change

To assess the impact of the programme, students were asked to indicate how good they thought they were at maths in the pre and post surveys and to rate how helpful they had found the programme for their maths learning. Student survey comments and data from the case study interviews suggested that at the end of the programme the students were somewhat more confident about their capacity to understand and be able to do maths. A majority considered they understood mathematics better during the programme but there was no relation between this self-rating and student achievement data for the group as a whole or for the New Zealand European, Māori or Pasifika sub-groups.

Student self-rating of their mathematics ability

ALiM and SMT students, across all sub-groups, provided a more positive rating of their ability in mathematics after the intervention but there was no significant difference between the pre or post means for any of the student sub-groups (New Zealand European, Māori and Pasifika) nor in the shifts they made.

The ALiM average rating for students who answered both the pre and the post survey (n= 569) shifted from 2.35 (SD=1.04) to 1.81 (SD=0.75). This is a positive shift because one was the most positive rating on the Likert scale. For the SMT students who answered the pre and post survey (n=255) the average moved from 2.45 to 1.88. These results indicate that the students gained in the perception of themselves as mathematically competent, a positive outcome given the links to motivation and persistence, but these results need to be interpreted with caution because over half of the students in each of the New Zealand European, Māori and Pasifika sub-groups, for both ALiM and SMT, rated their mathematics in the pre survey as very good or good (the two highest categories). This raises questions about students'

level of awareness of their own achievement, given they were selected for the programme because they were judged by the school as performing 'below' or 'well below' the expected National Standard.

Student perceptions of how much better they understood mathematics

Nearly all the students considered they understood mathematics much better throughout the programme, with around two-thirds of the students in the New Zealand European, Māori and Pasifika sub-groups strongly agreeing that this was the case and almost all of the remaining students agreeing. With SMT students, the ratios were that 62 per cent of New Zealand European strongly agreed, 71 per cent of the Māori students agreed and 59 per cent of the Pasifika students agreed, suggesting that on the whole the Pasifika students were less positive about the value of the SMT programme. Comparisons of students' achievement data, based on their responses to this question, did not yield any significant differences in either scale score or percentage of yearly growth analysis for the group as a whole or for the New Zealand European, Māori or Pasifika sub-groups. Nonetheless, a number of students commented that one of the things they liked about the programme was that their understanding of mathematics had increased. For example, an SMT stated: "I liked learning. At first I wasn't very good but now I am". The following commentaries are taken from student case study interviews:

Case-study school 10 (Decile 1): When interviewed, the children all spoke favourably about being in the 'ALiM' group. They showed what they had been working on by talking through the work in their books, which were large scrapbooks. The children were able to explain that they were learning how to add and subtract efficiently by using strategies and to describe the different materials they preferred to use. They were emphatic that their knowledge had increased, pointing out that they could now count in 10s, 20s and 100s, read three-digit numbers and understand about place value.

The children all stated that they "think better about maths problems". Several said it had been difficult in the beginning to "do some maths talking" but they were able to do this now. They liked working with their maths buddies on maths problems, enjoyed the games that were available and were very positive about being in the group with their teacher.

Case-study school 3: The children for this group were selected from one classroom, but the programme teacher was not their regular teacher. The teacher explained that she had spent the first week of the programme building up a rapport and relationship with the five boys in the group, and assessing their learning needs. The teacher reported that she used a lot of group work and encouraged the children to think, to take their time and to share how they were thinking. The boys were all very positive about their ALiM experience. They explained that they had learned and understood more about mathematics (particularly times tables, knowledge of fractions, addition and subtraction and place value). They demonstrated and talked about work in their books. They reported that they felt they know more about mathematics now, that they liked it more too. Some of the children commented that they really liked working with the teacher in the small-group situation and would like to continue so they could get "even better". They liked working with their friends. Some were able to talk about the links that they were making between their ALiM work and the mathematics they were completing in their classroom.

4.4 Nature of implementation models and organisation

In all schools, preparation for the programmes took place in Term 2, 2011. The ALiM and SMT programme policy design allowed principals considerable flexibility in structuring school programmes. Aside from the requirement that the programmes focus on accelerating the learning of students achieving 'below' or 'well below' National Standards and that students work with an effective teacher, principals were able to use the programme supports (teacher release and professional development hours) and design their programmes to the advantage of their schools, teacher and student strengths. Consequently, there were variations in the organisational forms—or models—of implementation across the schools. Here we outline these variations in terms of the elements of the programme.

Principal understanding of programme goals and supports

The reasons principals gave for school participation indicated they understood the goals of the programme. Around two-thirds described it as an opportunity to do something to raise the achievement of the sub-group of their students who were not at the desired level of achievement. That the focus of the initiative fitted with a school's strategic plan and that the programme would provide an opportunity for staff to learn more about how to support students who were low achievers in mathematics, was mentioned by around a third of ALiM principals. With ALiM principals there was a focus on benefits to the programme teacher (ALiM: 31/95) whereas with the SMT principals the focus was more on wider staff learning (SMT 13/26, 52 per cent). For some SMT principals it is possible that the focus on wider staff learning was a consequence of their school having previously participated in an ALiM programme. Some representative principal reasons for school participation were:

> To improve progress and achievement levels in Mathematics of Year 5 and 6 students is one of our learning targets. To increase teacher knowledge of effective practices in teaching mathematics with low achievers. As an intervention for Māori and Pasifika students who are underachieving in maths.

> We had identified a group of Māori students achieving below National Standard for our student achievement target, along with tracking all other students below the National Standard. This project offered the opportunity to have some resourcing, expertise, ideas on how we can improve the achievement of this group. We saw that this would not only benefit this group of students but other teachers through professional learning from our involvement and then ultimately student achievement.

> We have been using the numeracy strategy teaching approach for several years having done the M.O.E. contract. Until recently our children were achieving well. We do have a number of children who seem to be getting 'stuck' at certain levels. We are keen to find effective strategies to move them onto the next stage.

Principal leadership and support have been identified as a significant influence on the priority given to and subsequent success of, any intervention and/or professional development programme (Robinson, Hohepa, & Lloyd, 2009). There was evidence from survey and case study data that some schools had accorded priority to student participation in the ALiM and SMT programmes over other school activities. In one case study school, production rehearsals were rescheduled. One survey respondent asserted that the programme "needs the commitment from the teacher and management. There should be no disruptions to the programme what so ever. When there is a disruption the children lose the flow and you almost have to back up a step".

The programmes were designed on a high trust model that relied on principals' understanding of the goals of the programme to guide their use of the supports provided by the Ministry for the programme teaching and ensuring their teachers met the assessment and reporting requirements. The ALiM and the SMT programmes provided release time for

the programme teacher. Eighty-two of the ALiM principals in the pre survey stated that they had created time for the intervention teacher by employing a reliever; 86 had provided teaching resources and 66 said there would be professional development/help for the programme teacher. Similarly, in the pre survey 22 out of the 25 SMT principals stated they had created time for the programme teacher by employing a reliever; 23 had been able to provide teaching resources and 19 said there would be professional development/help for the teacher.

Principal understanding of the strategic focus and organisational elements of a policy programme is important because the way they interpret these has implications for the fidelity of implementation in their school (Coburn, 2003; Higgins & Parsons, 2011; McLaughlin & Mitra, 2001). These results suggest that the principals in the programmes were well aware of the intent of the programmes and the resources that were available to them to support the successful implementation.

Principal and teacher high expectations of success

At the beginning of the intervention period all principals expressed high hopes for the success of the programme. Half of the ALiM principals anticipated that the programme would accelerate the achievement of *all* participating students up to the level of their peers, 41 were expecting the programme would accelerate most students' learning up to the level of their peers and nine thought the intervention would accelerate some students' learning up to the level of their peers. Thirteen out of 25 SMT principals anticipated that the intervention would accelerate the achievement of all students and the remainder thought it would accelerate most children's learning up to the level of their peers.

Similarly, at the beginning of the programme all teachers expressed high hopes for the success of the programme with 51 out of the 95 ALiM teachers anticipating that the programme would accelerate all children's learning up to the level of their peers, 39 thought that the programme would accelerate most children's learning up to the level of their peers and five thought that the programme would accelerate some children's learning up to the level of their peers. Sixteen out of the 25 SMT teachers anticipated that the programme would accelerate all children's learning up to the level of their peers, seven thought that the programme would accelerate most children's learning up to the level of their peers and two thought that the programme would accelerate some children's learning up to the level of their peers.

These two aspects of understanding the goals of the programme and high expectation of success would seem to be foundational to establishing a positive context for the programmes to succeed in accomplishing their goals. Principal and teacher responses indicate that the information and materials provided to schools and the interactions they had had with Ministry personnel had served their purpose in communicating the goals of the programmes. Having high expectations for all students is fundamental to a culturally responsive pedagogy (Bishop & Glynn, 1999) and so principal and teacher expectations of success for most participating students augured well for a positive outcome for the programmes.

An effective and committed teacher

School principals were the key decision-maker about which teacher would teach the programme. Principals were advised to select teachers who were effective, with an interest in, and ability to work with students who were struggling. Principal reports of the selection criteria they used suggested that they had prioritised these factors.

In the pre survey all ALiM principals reported that the programme teacher had been selected on the basis that they were a good teacher of maths. Being prepared to change their teaching approach to meet children's needs (76/90), to accelerate student learning (69/90) and being effective with children who were behind in learning (62/90), were identified as important by between three-quarters and two-thirds of ALiM principals. Just under three-fifths (57/95) stated being good with children from different cultures had been a factor. Being a good teacher of maths was important

to almost all of the SMT principals (24/25). So, too, was being able to accelerate learning (21/25), being effective with children who are behind in learning (19/25), being able to change their teaching approach to meet children's needs (18/25) and being good with children from different cultures (15/25). Of interest, a majority of principals not only emphasised that the programme teacher was effective and had demonstrated the ability to work with the needs of the children who would be in the programmes but also that they put priority on teacher disposition to respond to children's emergent needs.

The majority of programme teachers in ALiM (81/95) and SMT (23/25) programmes had more than five years teaching experience. The implication of this is that they are likely to have had a number of years experience with the Numeracy Development Programme and to be conversant with the content and pedagogical focus of this programme. Of the 95 ALiM teachers, 14 had less than five years teaching experience. Of the 25 SMT teachers, two had less than five years teaching experience. One of the two SMT case study teachers had been a numeracy facilitator.

There was no statistically significant relationship between teacher years of experience and student scale score gain or percentage growth as measured by change in student PAT scores for students in the ALiM or the SMT programmes. However, case study principals were emphatic that teacher experience was important because of the programme focus on acceleration rather than maintenance. One principal explained that the school had found that a teacher aide did not necessarily have the depth of knowledge and expertise needed to interpret student ideas. Nor did they have access to networks and resources to help them develop activities to address student needs as these emerged. An experienced and effective teacher of mathematics, who was interested in and able to respond to student needs as they emerge would seem to be central to the success of the programmes.

Student selection

School selection processes for the restricted number of students who could participate in the programme were very thorough, taking into account a range of factors that they considered would optimise the likelihood that students would gain real benefit from their participation. Nearly all ALiM principals had selected students because of their low achievement, with just over two-thirds indicating that the potential for students to benefit from the programme also influenced selection decisions. The likelihood students would benefit from working in a small group was also taken into account by over half of the principals. Raising achievement for Māori and Pasifika was a focus for a number of principals (38 per cent and 16 per cent, respectively).

The SMT programme was aimed at students who were achieving well below National Standards. All but one principal had selected students for the SMT programme because of their low achievement. Around two-thirds of the SMT principals indicated that the potential for students to benefit from the programme influenced selection decisions. The likelihood students would benefit from working in a small group was also taken into account by just under three-quarters of principals. Raising achievement for Māori and Pasifika was a focus for a number of principals (20 per cent and 12 per cent respectively).

ALiM and SMT teacher comments in the post survey identified regular attendance and ability to work in a group as factors that contributed to some students making a lot more progress than others.

Case study principals and teachers elaborated that once students had been identified on the basis of their mathematics achievement, the criteria for participation included regular attendance (considered important if a student was to take full advantage of the programme) the ability to work in a small group, and potential to benefit in terms of both attitude and achievement shifts. These additional criteria were discussed as influences on student success.

Teachers in the survey and case studies reported that in the future they would aim to reduce breadth of student understanding in the group to enable them to better meet individual needs. When they had very detailed data on student understanding, even an apparently cohesive group could be seen to require a diverse range of responsive teaching practices. These teachers considered that if the students had similar number knowledge this would enable a stronger and more nuanced focus on individual needs.

Taken together, the data sets suggest that while student achievement data might be used to identify potential participants, it is worthwhile to consider factors such as regular attendance and ability to work in a small group. This does, however, raise questions about whether and how students who have a poor attendance rate (for example) might access extra help.

The number of students in the programmes

The programme was designed so that teachers were able to work intensively with a small group of students. In the ALiM programme, teachers taught three to 12 students. There were 71 groups of five to eight students, four teachers taught four students and the remainder taught nine to 12 students. On the whole, ALiM principals (72, 89 per cent) thought the number of children in the groups was about right.

With the SMT programme, the intention was that teachers taught a number of groups. SMT teachers reported they taught seven to 38 students; eight teachers taught 12 or 13 students and seven taught 17 to 20 students. No survey data was collected on the size of the groups taught by the SMT teachers but in the two case study schools the groups comprised 4-5 students. Most SMT principals (16, 84 per cent) thought the number of students in their programmes were about right.

However, a small number of teachers indicated that if they were to teach the programme another time they would like to work with fewer students so they had more time to spend with individual students.

> I would have smaller groups. Eight in a group was just manageable. However, it was difficult to give the attention to such a large group. If I had two groups of four I would then need extra release time to take the second group.

Overwhelmingly, principals, teachers and students indicated they saw value in working with a small group of students. Their views are discussed in detail in Section 4.5 as a component of effective pedagogy but their views are also significant here as an endorsement for the design of the policy.

Number and duration of sessions per week

ALiM teacher responses indicate that the groups met at least three times per week for at least 20 minutes. Of the 95 ALiM teachers who replied to the post survey, 17 (18 per cent) had taught their mathematics students three times per week, 62 (65 per cent) had taught their students four times per week and 16 (17 per cent) had taught five times per week. Nearly three-quarters of the ALiM teachers (69, 73 per cent) stated that their teaching sessions lasted for more than 30 minutes and 26 (27 per cent) that the sessions lasted for 20-30 minutes. Twelve ALiM teachers reported their teaching sessions were instead of the usual classroom mathematics.

Comparisons of students' achievement based on the frequency of the programme lessons did not yield any significant differences in either scale-score change or in the percentage of yearly growth analysis. However, students who were taught for more than 30 minutes experienced a significantly greater increase in scale scores [$F(1, 410) = 10.85$, $p < 001$] (average increase in scale scores was 6.78 and 4.22) and in the percentage of yearly increase [$F(1, 410) = 13.43$, $p <$

001] (average increase in percentage of yearly increase was 110 and 63) than the students who were taught for less than 30 minutes, indicating longer sessions be recommended.

Six (23 per cent) of the 26 SMT teachers taught their mathematics students three times per week, 13 (50 per cent) taught four times per week and seven (27 per cent) taught five times per week. SMT sessions tended to be shorter than the ALiM sessions with just over half (14/26; 54 per cent) lasting more than 30 minutes and 12 or 46 per cent lasting from 20-30 minutes. The SMT lessons were all in addition to classroom mathematics lessons.

Comparisons of students' achievement based on the frequency and duration of the programme lessons, duration of the lessons did not yield any significant differences in either scale-score change or in the percentage of yearly growth analysis.

Where the teaching takes place

In the pre-survey, 76 (77 per cent) of the ALiM principals reported they planned to provide a separate teaching space for the programme. All SMT principals planned to provide a separate teaching space. Teacher commentary indicated that most taught their programme group in a dedicated space.

There was no statistically significant relationship between the location of the teaching room and student achievement, as measured by PAT score difference or percentage growth, but a number of the survey and case study comments asserted there was value in working away from the classroom. Both teachers and students said they were able to focus on the task at hand when there were fewer distractions. A number of teachers were emphatic about the value of giving students their full attention, with one teacher explaining, "In a normal classroom we have the pressure of noise level, on task behaviours and getting to work with the next group". A representative teacher survey comment on this point was:

> … as it was a smaller group and we weren't in a classroom environment, you could pay more attention to the students instead of worrying about the rest of the students. As we worked in a small room, interruptions were non-existent.

An SMT student commented, "In Room 2 it is different because we learn lots of stuff. It's peaceful and we get to concentrate".

Most of the case study groups worked in a separate room. Students and teachers reported that having a dedicated space made their time together 'special', and something to be looked forward to. A case study teacher explained:

> Every child was encouraged to share their thinking. All had opportunity to teach the group things they had mastered. Being removed from the class in our own small space was very important and the children saw this as special and our sessions often went over the hour because we were having fun.

A different location was particularly important when students were working with their own teacher. One Pasifika girl told a researcher, "I love going to ALiM maths, it helps me to learn my maths better cos it is a special place for the ALiM kids". This student knew she was an 'ALiM' student and was proud of this. Her teacher reported that this student had rarely spoken in class prior to participating in the ALiM programme. The influence of the location for the teaching was further highlighted by the case where teaching began in the school boardroom and then moved to an empty classroom. The teacher said the furniture and tone of the boardroom was not as conducive to learning as the classroom they moved to. In another case study school, the teacher and students reported they liked the routine of going to the ALiM room each day. In each case the teachers considered that working in another space meant they were able to

devote their full attention to the group. Students commented that no other students distracted them by demanding teacher attention and/or asking them for help or equipment. This option is recommended.

Teacher release time for teaching, planning and reflection

Teachers valued the time provided within the programmes for planning, preparation, teaching and reflection. Evidence from the survey and case study data suggest that, given the intensity of the programme, teachers having the time day-to-day to reflect and prepare made a substantial difference, in effect allowing them to enact a pedagogy that was responsive to individual needs and interests. Teacher comments highlighted the value of having time to plan and to reflect after teaching sessions.

> The planning is paramount—make sure you have assessed your children really well, got all the information you can from the test and formulate your teaching from that. Be flexible. Have a big variety of materials for the children to manipulate during their learning. Reflect constantly on your own and with the children. Push the mathematics language.

Teachers appreciated having time to reflect soon after a lesson and to plan for next steps/the next day's learning.

> Make sure there is more time to reflect at the end of each lesson so that any needs can be addressed straight away at the next lesson. I took two groups one after the other and some time in between would have been beneficial to record the next steps and what went well.

Teachers were asked to complete a reflective journal and while no teachers made direct comments about this, a number of teachers noted that the thinking and 'considered reflection' time available within the programme meant they had time to identify and access resources (the ALiM and Te Kete Ipurangi (TKI) websites, support people, maths equipment, and so on). They also had time to seek out help from colleagues. Teachers having the time to consider the meaning and implications for teaching of student ideas, actions and orientations is central to them ensuring that their teaching is responsive to student interests and needs. After the programme, 72 (89 per cent) out of 81 ALiM principals reported the time allocated for teachers in the programme had been 'about right', eight (10 per cent) that it was 'not enough' and one (1 per cent) that it was 'too much'. Of the SMT principals, 17 (90 per cent) reported the time for teachers was 'about right', one (5 per cent) that it was 'too much' and one (5 per cent) that it was 'not enough'. Principal and teacher post-survey comments indicated that schools providing time for teacher preparation and reflection was seen to be key to the success of any subsequent intensive and targeted programmes modelled on ALiM and/or SMT.

Classroom teachers as programme teachers

Principals and teachers reported a number of advantages to the programme teacher being a regular member of staff and the classroom teacher of the students in the programme. The impression gained by the researchers when they spoke to the case study students was that when working with their classroom teacher, the children were able to build on from their already established relationships. This bond facilitated their participation in the small programme mathematics group because they felt safe and comfortable with the teacher. Case study teachers spoke of being able to move quickly into mathematical dialogue when teaching students from their own classes. They pointed out that as a student's classroom teacher they were more readily able to capitalise on gains made within the programme in the classroom programme. For example, a case study teacher stated that she was able to help the children in her class to "move out of the tail" and "passing the hurdles that were in front of them before" by taking what she learned from the small group situation into their class. (Case study 3.) Some teachers provided survey comments on the value of teaching students from their own classes, with a number stating they would want to work with students from their own class if they were to participate in another programme.

The importance of relationships also featured in teacher comments about working with students from other classes, illustrating the value teachers put on this aspect, as the following comment shows. It also illustrates this teacher's appreciation of the role played by her/his own enthusiasm for mathematics and the programme:

> Be excited by maths, it's infectious and your students will respond. If the students are not from your class, build a relationship with your group—most important. Make it fun and make it clear to your students that they are maths learners, that they can achieve and you are going to help them. The results are unbelievable.

Teacher responses to the post-survey questions that focused on what had been of value, what a teacher would do differently and advice for other teachers included comments about the importance of regular communication with students' classroom teachers. Suggestions made were that the programme teacher meet regularly with the classroom teacher and/or visit the classroom to observe the programme students and/or that the classroom teacher observes their students in the programme group.

Many principals arranged for the programme teacher to share their experiences and learning with colleagues and the staff as a whole and the programme teachers appreciated and saw value in this process. They also garnered considerable support from colleagues, especially where there was a sense of whole-school commitment to the programme, as reported by most case study teachers.

On the other hand, a number of teachers described the dilemmas they faced because they were missing teaching with their regular classes. The following teacher saw this as missed opportunities for her/his own learning as well as for her/his students' learning.

> My only real concern was that participating in ALiM meant I spent a lot of time out of my own class. This was 40 minutes for 4-days a week mostly. Even though you plan for what is covered while you are out, you still feel the class is either missing out, or that you are missing the learning yourself as a teacher. To cater for this I switched maths and reading around half way through the term on my timetable so that I could teach maths in my own class again.

Teacher confidence in their reliever was important in ameliorating this concern but nonetheless this aspect needs careful attention. Case study principals and teachers reported they had received some queries from parents of non-participating students expressing concern about their children missing out on learning with the regular class teacher.

There was some indication from students that working with their own teacher eased their concerns that they were missing out on what the class was doing. Working with peers (friends) from their own classes was said to support their participation. When they knew and trusted other group members they were more comfortable with answering questions, discussing tentative ideas and seeking help. However, some students noted that they had formed new relationships through their participation in the programme.

Practical support for the programme teacher

ALiM and SMT teachers had access to a number of hours support from an external advisor. In the post-survey, 84 of the 95 ALiM teachers reported that a 'mathematics advisor' had provided help, with three-quarters of these teachers stating the mathematics advisor has been of most help to them. Sixteen ALiM teachers had had help from a school curriculum leader, 25 from an in-school colleague, five from a critical friend from outside the school and 12 from an external advisor.

Two of the 26 SMT teachers said they had not sought help from others and one had worked with the principal alone. Altogether 19 SMT teachers had had help from a 'mathematics advisor', 13 from the 'principal', three from the 'curriculum leader'. Of the 26 SMT teachers, 15 indicated the 'mathematics advisor' had been most helpful, two selected the 'principal' and others chose colleagues within and outside the school.

Some teachers reported that facilitator support had been particularly helpful because they had an already established working relationship with them. Teacher survey comments and case study interviews indicated that, on the whole, but not universally, teachers found the facilitators supportive, encouraging and able to suggest new or alternative ideas, particularly when they became stuck about how to proceed. The following quote illustrates the breadth of advice and guidance teachers sought and received.

> My facilitator was an email away. We connected regularly with her making suggestions, providing links and/or resources. She came to my school and worked with me initially when testing and choosing students, she assisted me to enter data and find my way around the ALiM resources online. She came to observe 2–3 lessons with my group and was able to give me practical support and guidance, and we met with another facilitator and other ALiM teachers 2-3 times to share progress and ideas.

In the ALiM schools, students whose teachers had their principal's help experienced a significantly greater change in scale score than students whose teachers did not have the principal's help (6.99 vs. 5.52 respectively) [$F(1,410)=4.23$, $p < 0.05$]. Similar results were obtained for percentage of yearly increase analysis (113.19 vs. 87.84 respectively) [$F(1,410)=4.42$, $p < 0.05$]. In SMT schools, whether the teacher was supported by the principal or not, had no bearing on the students' change in scale score or the percentage of yearly increase. It is not possible to comment on the nature of principal assistance but it is possible that principal professional and personal support during the programme was important in communicating to the teacher that the programme was of value to the school. If principal help involved classroom visits it is likely this also communicated to students that they, and their learning, within the programme were important.

A collective project rather than individual responsibility

Some case study principals and teachers implied that they felt under the spotlight to raise student achievement within the timeframe of the programme. Through their comments they positioned raising student achievement as a collective responsibility, even though a particular teacher might be conducting the teaching. This sense of collective responsibility gave added impetus to the teacher actions of seeking advice and guidance about how particular mathematics ideas might be taught in different ways to different children. Because the school was committed to the project, the teachers could be assured that their colleagues would assist them to help the group of children who had been identified as underachieving. At least two case study teachers had sought out the Reading Recovery teacher for advice on how to support mathematics language development. One teacher advised:

> It is a learning curve as much for yourself as it is for the children, so don't beat yourself up. If in doubt, ask! Always have clear in your mind the steps you need to take with the children to get them to advance. I had these printed out in a table and referred to them regularly. Don't plan too far ahead—it is a day-by-day process.

In a positive frame, there was sense that in some cases a school-wide learning community was emerging around the goal of promoting the learning of students who were performing below expectations. This community was grounded on the programme teacher's deeper local knowledge of the needs and learning preferences of these students and propelled by evidence that the attainment of these students could be raised with intensive targeted and data-informed responsive teaching.

Ministry reporting requirements

Principals and teachers knew from the start of the programme that they would be required to lodge pre- and post-PAT and NumPA data with the NZCER and the nzwebsite, respectively, and this would be used to evaluate students' learning gains. Teachers were required, and many principals attended, planning days at the beginning of the programme. Teachers were expected to attend an expo day at the end of the programme and present findings on student achievement and effective teaching approaches. These two events can be seen to serve a dual function. Teacher involvement in the planning days provided an opportunity to share ideas and to establish a network of schools and peers from whom teachers could seek advice and share ideas. There were indications from teacher participants that, from their perspective, the requirement to present student outcomes and effective practices at the expo contributed to their sense of belonging to a wider community of interest and, at the same time, held to account for their actions.

Bringing the elements together

The following vignettes, taken from the case study schools, illustrate some of the ways that schools brought these elements together to make the most of school contextual factors.

Case study school 1 (Decile 3): The principal from the case study one school stated that its assessment practices had identified that mathematics within the school was an area that several students were 'below' the expected National Standards. The principal had been keen for the school to participate in the ALiM programme. The teacher was selected because he had well established positive relationships with students. The principal stated, "I made it easy for R (the classroom teacher). Everything revolves around ALiM. I made sure that other teachers supported him". The student group included three Māori and four Pasifika children (one of whom left part way through) five boys and two girls from the ALiM teacher's Year 5/6 class. The children and the teacher worked together each day in a space away from their regular classroom. The teacher reported the time was used for carefully planned, purposeful intensive sessions that focused on the development of 'learning relationships'.

Case study school 10 (Decile 1): The teacher in the case study school 10 was chosen because she was an 'enquirer'. The school principal considered that the programme demanded a teacher who was fully committed to identifying mathematical needs and acting upon them in an organised way so that deeper learning could occur. The teacher and the children (four Samoan, two Māori, one European and one Kiribati) were from the same class. The children were selected because the school-wide data indicated that they were below the expected norms for mathematics. The teacher stated that working with children from her own class was an advantage because she already had a relationship with them and she knew their capabilities and attitudes towards mathematics. Her aim was to support the children to develop their confidence with mathematics, to reinforce their use of mathematical language and to help them progress from counting on to using more efficient strategies for addition and subtraction.

The ALiM programme was prioritised. School events (such as rehearsals for the school production) were organised around the ALiM programme so that there was a consistent time for teacher release, reliever employment and for children to attend the programme. Student comments indicated that this provided a strong signal to them of the importance of participation in the programme. They appreciated that they did not need to miss out on other exciting school events. Programme materials and equipment were housed in an empty classroom in the school and used solely for ALiM. The teacher used the release time to plan and prepare lessons and to source material on a daily basis. The programme began with the teacher planning for the whole group but as learning occurred and children progressed, she changed group composition to include individual, pair and small group work as well.

Case study school 11 (Decile 3): The teacher in case study 11 was in a school that prided itself on being 'culturally responsive'. The teacher taught the ALiM programme with children in her regular class. She reported that she had a

positive relationship with the children's parents and it was helpful that a translator was available if any communication was required. The teaching took place in a small withdrawal room attached to a classroom.

This teacher used a 'concept circle' with the children; a practice commonly used with second-language learners when learning English. The children had similar work to complete but the teacher changed the tasks to include the children's names and to suit their interests. She structured the sessions to provide one-on-one interaction opportunities with her and helped the children to set goals and self- assess their achievements against these goals. She reported that she took care to ensure that children listened to each other and developed cooperative learning skills. Each child had a personal scrapbook where the activities were placed so that each child and the teacher had a reference point for use when tracking and celebrating progress. The teacher noted that over the course of the programme the children developed in confidence in the wider class and were participating and contributing ideas more freely with other children.

Regular contact was made with the numeracy facilitator who was able to offer professional advice, encouragement and support. The teacher also used TKI for ideas. She reported that her regular mathematics programme was richer as a result of her experience in the programme. The release time was used for planning and teaching, both of which required "intensive use of time".

Case study school 5 (Decile 3): The principal of case study school 5 joined the programme in recognition that some children in the school could "benefit from a boost". A teacher who had been a numeracy facilitator for six years had been appointed as a staff member and considered she would be "able to carry out the intervention" because of her expertise and knowledge of how to encourage high quality interactions and strong pedagogical content knowledge. For this intensive programme, 16 children, 13 of whom were Māori, were identified from PAT and GLoSS test results across a range of classes in the school. The children were assessed as working at Stages 3 or 4 of the Number Framework and the main intent for their participation was to support them to attain Stage 5 proficiency. Each group was carefully organised so there was a gender mix and the children were socially compatible. The teaching sessions were intensive 30-minute sessions, four afternoons each week for each group.

Concluding comment

To summarise, school programme design contained aspirational and practical elements that built on and took advantage of the structure of, and support for, the programmes. Of significance, programme design was informed by clear principal and teacher understanding of the goals of the programmes and high expectations for student success. Principal design of their school programme took into account teacher expertise and demonstrated ability to forge positive and productive relationships; student achievement and potential to benefit from, and work within, the programme. Organisational matters, such as giving priority to student participation, the small group format, a dedicated teaching space, frequent lessons and teacher access to release time for reflection and planning were considered central to the success of the programme by principals and teachers. Of these factors, however, the only element that had a statistically significant relationship with student achievement was lesson duration of at least 30 minutes and this was only for ALiM students. Nonetheless, principals were emphatic that it had been pivotal that the programme teacher had been an experienced and effective teacher of mathematics, who was interested and able to respond to student needs as they emerged.

4.5 Pedagogical approaches

An important aim of the programmes was to provide teaching that was responsive to the needs and interests of groups of students who were achieving 'below' or well below the National Standards in mathematics, with particular attention being placed on Māori and Pasifika students. In this part of the report we set out details of findings that focus on the nature and responsiveness of teaching approaches, including any differences across the targeted groups. The section includes data on perceptions of the extent to which responsive pedagogical approaches better met the needs of students and changes in teachers' usual teaching practices. It provides a summary of survey and case study data related to (i) principal understanding of the meaning of culturally responsive teaching (ii) teacher reports of the approaches they found most effective (iii) teacher reports of differences in their practice, and advice and recommendations to other teachers.

Principal understandings of culturally responsive pedagogy

In the pre-survey, ALiM and SMT principals were asked to describe what being culturally responsive meant to them. Their views were considered important in establishing a frame for teacher and school orientation to the intent of the programme. As can be seen from the examples detailed below, principal responses were both comprehensive and congruent with the characteristics of culturally responsive pedagogy (Section 1). They included mention of factors such as the importance of relationships, high expectations, getting to know students and their family/whānau and so on. Principal comments also encompassed the features of effective mathematics teaching as detailed in the booklet *Effective pedagogy in mathematics* (Anthony & Walshaw, 2009). Of importance within the context of the ALiM and SMT programmes is the emphasis upon utilising approaches that build on students' thinking, offering students worthwhile tasks, building mathematical language and using assessment of learning to plan further learning.

Representative comments are listed below:

> To first of all know the home culture of their students, demonstrate in their teaching this understanding: talking with students one-on-one, linking with home, valuing their culture by including learning around it, putting into practice effective practices: formative assessment, give positive feedback for learning, inquire into their own practices to seek opportunities to improve, provide opportunities for students to share their culture, develop effective learning relationships with students and their family.

> By using a range of languages within everyday classroom routines. By highlighting different ways of doing things by different cultures and getting children to teach the class about these. By encouraging the class to set their own behaviour guidelines and come up with a consequence/s for moving outside of those boundaries. Group work, 'talking to learn' in pairs and small groups, teacher working alongside and not at the front of class, getting whānau involved and communicating with whānau about everyday success, allowing students to show what they are learning through a wide variety of media, using ICT to 'compete' eg, mathletics.

> To be aware of the children's background and culture differences, and to allow for this in interactions with the child. To ensure that teaching and learning activities followed a clear materials, imaging, number properties sequence, acknowledging different learning styles, valuing the mix of cultures and the differences that can be brought out of the learning through these, and accepting differing cultural responses. Most of the children we have targeted have low esteem, owing to ongoing low achievement in most areas of the curriculum—to value these children for what they are able to contribute and to develop their confidence is vital to the success of this intervention. Relationships are the key—relationships between the group, and with the teacher. Celebrating successes—and ensuring that

teaching is explicit, and targeting small next steps, with clear mathematical goals and success criteria evident to all. Contexts for learning—problems posed should include links to children's own backgrounds—to make connections for them.

Teacher understandings and practices to respond to students

Teacher views of effective mathematics and culturally responsive pedagogy were explored in the pre and post survey. They were also asked their views of the three most effective strategies they had used and how they had adapted their teaching to better meet the needs of Māori and Pasifika students. Teacher post-programme responses were generally similar to their pre-survey comments suggesting the teachers were, as had been required within the programme, known to be effective practitioners with the skills to work successfully with low-achieving students.

Culturally responsive pedagogy and effective pedagogy for mathematics

The central features of culturally responsive pedagogy and the principles of effective mathematics teaching were outlined at the programme planning days. The case study teachers and teachers at the planning days intimated that they were not necessarily familiar with the term 'culturally responsive pedagogy'. However, teachers provided extensive responses to a pre-survey question that probed their understanding of culturally responsive pedagogy. Their descriptions of effective practices were congruent with culturally responsive pedagogy and the principles of effective mathematics pedagogy. Over two-thirds of teachers in both groups reported they 'almost always' had high expectations for learning and a positive relationship with all of their students. They built on students' prior knowledge, then encouraged students to share their ideas and provided feedback and adapted their teaching based on student progress. The following aspects were mentioned numerous times in teacher descriptions of culturally responsive pedagogy:

- understand and value students' cultures and languages. (Some teachers noted that it was important they understand their own culture.)
- build a positive relationship with students, including getting to know their interests and families
- hold high expectations for success for all students
- provide opportunities for students to work together and to talk about their learning
- use a variety of tasks
- use equipment—a hands-on experience
- create an environment where it is safe for students to share tentative ideas.

Teacher post-programme descriptions of effective pedagogy were generally similar to their pre-survey comments suggesting the teachers were, as had been required within the programme, effective practitioners with the skills to work successfully with struggling students. Nonetheless, a number of teachers indicated their experience of working intensively with a small group of students had challenged and extended their thinking on how to support student learning and what students could achieve. They explained that this was because they had been able listen carefully to students with the time and freedom to focus on meeting their needs. Section 4.5 elaborates on this point.

ALiM teacher reports of effective practice

In the post-survey a substantial majority (85 per cent) of ALiM teachers rated students working in small groups and encouraging student talk as very effective, presumably because of the opportunities for indepth dialogue that the small

group setting made possible. Encouraging children to work with a buddy and one-on-one teaching, which are potentially more individually than collectively focused activities, were rated as very effective by around two-thirds of respondents. Having students work on relevant problems and the provision of personalised formative feedback are also elements of teaching that is responsive. Ninety per cent of all the ALiM teachers reported these approaches as very effective or effective. In the small group setting of the programmes, modelling and using equipment were reported as being very effective by around 80 per cent of teachers. None of these strategies on their own had any statistically significant relationships to student achievement.

The factors teachers identified as effective coalesced into three clusters: strategies in support of interaction (talking with the teacher, a buddy and in a small group and personalised feedback), planning, and task design to support access to ideas (the use of equipment and relevant tasks). There was a statistically significant relationship between those who considered personalised feedback very effective and planning very effective: 26/32 of those who thought planning was effective also thought personalised feedback important. Teachers can generate and provide feedback in the moment but this places heavy demands on teacher knowledge of mathematics, of the particular student (their ideas, dispositions and interests) and teacher ability to take action to bring these two aspects together to offer the student a way forward in their mathematics learning. The link between feedback and planning suggests the possibility that teachers who valued personalised feedback took advantage of teacher release time and the short time between lessons to plan for feedback. Teacher survey and case study comments indicated this was the case.

Nearly all of those who rated relevant problems as very effective also rated encouraging student talk (62/68), using equipment (63/68) and working in a small group (64/68) as very effective. The consistency across these frequencies suggests that teachers who rated relevant problems had found it valuable to encourage students to talk together and use equipment while solving these problems. Not surprisingly, 64/65 teachers who thought student talk was very effective also thought students working with a buddy was very effective, suggesting these teachers employed student collaboration as a means to foster mathematical talk.

When ALiM teachers described the three teaching approaches that had proved to be most effective with their groups, five strategies predominated. These were:

- the use of materials
- the use of a variety of approaches (to explain the same idea)
- discussion with peers
- forming positive relationships
- a structured programme in which students knew the routines and felt safe.

The following comments are illustrative of the combination of approaches teachers had found to be effective:

> Much more targeted teaching, wider range of activities and less problems—more talking raising the ante in terms of articulating their thinking, wait time longer, more revisiting of the same concept in different ways with different equipment, more time to tailor a flexible programme from day to day, lots of games.

> Catered for needs by letting them share and discuss strategies amongst themselves and created a classroom environment where children took risks and learnt by making mistakes and using materials to prove their answers.
>
> Provided teaching in a 'no distraction' space with groups of no more than five. Planned to build on learning from one lesson to the next. Made equipment available in each session and expected it to be used. Used real life situations to pose problems and limited the number of problems we solved in each session to allow time to model the problem and explore different solutions.

SMT teacher reports of effective practices

SMT teacher reports of particular teaching approaches indicated most found working in small groups and encouraging student talk to be very effective (89 per cent). Again, these approaches can be seen as taking advantage of the small group environment. Encouraging working with a buddy and one-on-one teaching were rated as very effective by 73 per cent and 42 per cent of respondents respectively. Just under one-third of the SMT teachers (31 per cent) indicated they did not plan for one-on-one teaching implying a strong focus on taking advantage of small group dynamics and/or them considering they had the time and ability to respond to student needs as they emerged (all but two of the 26 SMT teachers had more than five years teaching experience). Teachers reported that having students work on relevant problems and providing personalised formative feedback were effective practices. In the small group setting, modelling and using equipment were both considered very effective by around 80 per cent of teachers.

With regard to frequency of use of different approaches, the SMT results showed that less than half of the teachers reported they used one-on-one tasks daily; eight teachers did not use one-on-one tuition. It seems probable that this was because of the use they made of student talk within the group and with a buddy.

An analysis that explored the relationship between SMT student achievement and teacher use of particular teaching approaches found that the only strategy that yielded a statistically significant relationship with change in student achievement was the use of equipment. The teachers of those students who had lower pre-programme scores used equipment more often than those whose students had higher scores, which seems reasonable if teachers were using equipment to help make student thinking explicit. Given the sample size and the variation in frequency of use of methods, this finding should be interpreted with caution.

Factor analysis found three clusters in the teaching strategies listed for teachers to choose from with no obvious coherence amongst the clusters, which were: 1) encouraging student talk, relevant problems, planning and one-on-one interaction 2) modelling, use of equipment and a small group 3) feedback and working with a buddy (with the possibility working with a buddy ensured a student had access to timely feedback). SMT teachers were also asked to describe the three teaching approaches that had proved to be most effective with their groups. Two strategies predominated: having time for talking about mathematics and the use of appropriate equipment that was readily available. Other strategies that had a number mentions were teaching targeted to individual student needs and positive relationships. Hence, it would seem that for teachers working with students who are achieving at well below expectation the use of equipment is important. The use of equipment fits with the notion that effective teachers use carefully selected tools and representations to support and develop student mathematical thinking (Anthony & Walshaw, 2009). This use of a variety of manipulatives is likely to have helped SMT students express and develop and hence gain feedback on their ideas. SMT students valued the chance to play mathematical games and the equipment and interaction involved played a role in engaging, motivating, focusing and extending student learning.

Teaching approaches to meet the specific needs of Māori students

When asked about teaching approaches that were most effective, and/or changes to meet the specific needs of Māori students, a number of ALiM and SMT teachers reported they had not altered their teaching in any specific ways to meet the needs of the Māori students in their groups. The reasons provided were that they already knew and had an effective teaching relationship with the intervention student(s), they taught a class with a high proportion of Māori students and considered their current practice was responsive to this, and that their focus was on each of the students in their small groups as individuals. The following is one of the more extended responses making this point.

> I did teach Māori students, but I don't think I changed my teaching style. Manaakitanga (ethic of care) is a huge part of our school philosophy—we have a large Māori roll. I used tuakana/teina relationships in a ZPD context rather than age. The children did learn from each other. Emphasising the collaborative nature of our group—whānau/whānaungatanga aided in an increase of confidence and no one child was singled out.

When teachers described what they did to meet the needs of their Māori students, building positive relationships to create a setting that supported risk-taking and learning was mentioned most frequently. Other recommended approaches were for opportunities to discuss with a buddy and peers, the use of hands-on activities and the use of te reo Māori. The following comments show approaches teachers used to meet the needs of Māori students.

> I found it was beneficial to spend time every day on general chat, whether the Rugby World Cup, their own sport, friends, hassles around them, it really helped to clear the air, and got it out then we moved on. I don't think this was just because students were Māori, but I think part of getting alongside the students so we all valued each other.

> The biggest change I focused on was building relationships and a respectful safe environment. All discussions were valued; risk taking was celebrated, as were successes. It was a lovely, high-energy 40 minutes. I looked forward to it and I know the boys did because they checked in daily to make sure I was coming.

When asked about changes to meet the specific needs of Māori students most SMT teachers reported they had not altered their teaching in any specific ways for the same reasons as those given by the ALiM teachers. The main teaching approach endorsed was to focus on relationship building with students and with their family/whānau. The use of a variety of equipment and opportunities for discussion about mathematics were also recommended.

Teaching approaches to meet the specific needs of Pasifika students

The next set of comments is about approaches teachers used to address the particular needs and interests of Pasifika students. A number of ALiM teachers reported that they had not taught a Pasifika student, while others stated they had used the same strategies for all group members. In another group the teacher listed strategies they had used to build student confidence and to encourage students to express their ideas, along with strategies such as encouraging students to use 'their own languages' and opportunities for students to have one-to-one communication with the teacher. Teachers also commented on the value of monitoring and managing the pace of learning, giving time for students to feel comfortable with concepts.

> One Tongan pupil was very shy and reluctant to share his thoughts initially, but I helped him be more confident by first letting him share his thoughts with a buddy and as we went along, he realised he was good and became more eager to air his thoughts. Lots of praise and positive reinforcement also helped

> the pupil to have a go and not to be afraid. Sometimes working alongside him and asking him simple questions also helped him make connections.
>
> I asked them to use their own languages when working with place value. Pasifika and Māori languages make much more sense to students. The students who are fluent in their own languages were very quick to respond positively. The others had to go home to find out and that provided a valuable link between home and school.
>
> I had one Fijian student—we know each other really well, I've taught her for two years now. I didn't do anything different to what I do in my class anyway (in regards to teaching techniques). What helped her was she was in a smaller group and I gave her more of my time.

An SMT case study teacher who was teaching mainly Pasifika students provided a similar list of suggestions. She emphasised the importance of creating a safe environment and encouraging Pasifika students to share their thinking.

Insights gained

A number of the ALiM and SMT teachers indicated their experience of working intensively with a small group of students had challenged and extended their thinking on how to support student learning and what students could achieve. They explained that in large part had happened because they had been able listen carefully to students with the time and freedom to focus on meeting their needs. The practices that were most frequently discussed are set out below.

Responsive planning and preparation

Teacher advice to other teachers was that they needed to be well prepared and planned but also to be prepared to respond to student ideas and interests as they emerged during and across lessons. Three-quarters of the ALiM teachers rated planning as very or somewhat effective in supporting their teaching, with 68 of them stating they planned daily. Four-fifths of the SMT teachers said they planned daily. This frequency of planning suggests that the teachers were responding on a daily basis to the sense that students were making of, and taking from, their teaching tasks. Teachers emphasised the importance of being clear about students' mathematical understandings, recommending the use of multiple sources of data and using this information to inform their planning. They viewed careful planning and preparation as enhancing their capacity to be flexible and responsive to student learning needs as they occurred, commenting it was important they took the time to fully understand the mathematics that was to be learned. Planning from day to day, based on reflection on how students had reacted to different tasks and ideas was recommended. Indicative comments on the value of formative assessment and approaches for second language learners are:

> I used constant formative assessment for individuals but then as the children developed their confidence I had them working together collaboratively so they could strategise together to solve problems.

Evidence from case study teacher planning indicated that many teachers produced detailed plans for individual lessons. Many of these plans were annotated with reflective comments and with adjustments to teaching activities to respond to the needs of individual students. One case study teacher was emphatic that student progress for her group was owing to the targeted nature of her teaching programme explaining, "I know exactly where they're at". There was 'no downtime' during a session because she had time after each session to prepare for the next day. She had the, "equipment all ready".

The importance of dialogue and listening closely to students

Survey and case study comments indicated teachers had experienced the programme as a rich opportunity for them to talk with, listen to and learn with and from their students. In the small-group setting, learning mathematics was

problematised and became a shared endeavour. Teachers encouraged, and frequently pressed students to share their thinking. In one teacher's words, "there was no place to hide". This was a productive action because being wrong in this setting was seen as part of learning. Teacher advice to others about the things they would do differently/the same next time indicated that one spin-off from their participation was that they had benefited from a deeper understanding of the nuances of student thinking and ways of working.

> Listening to the students' responses was enlightening and asking them to explain their thinking helped to fix misconceptions that I would not have thought about eg, with the language of place value, eg, six hundred and forty thousand, one child wrote 40,600—so time was spent talking about the language etc. This made me aware of how difficult children find place value and how they need a lot of time on practising 'see, say, do' with place value with bigger numbers also.

Time and resources to respond in the moment

Teachers commented that within the small group they had "more time to do moment-by-moment assessments, responding to student thinking, discussions and observations". The implication was that as effective teachers they were able to use information to adapt their teaching to respond to student needs as they emerged. A number of teachers pointed out that when they were teaching in a designated space, which had been deliberately set up with a range of potentially useful resources, they were able to deploy the resources in the moment to offer students alternative entry and development points for ideas. One teacher explained:

> More time to listen into responses and alter teaching on the spot, rather than waiting until the next lesson.

Comments from some students identified that they considered easy and immediate access to a teacher when they had a question had contributed to their learning. That the teacher's feedback was addressed solely to them and their needs was also said to help them better understand and progress their own learning.

Time for students to fully embed concepts

Students having time to make sense of ideas within the small group emerged as a contributor to student success in teacher comments about what in particular led to student success. Teachers intimated that within the group they felt they had more time and the flexibility to pursue ideas until they were confident students understood them. In the words of one teacher, "I did not feel under a time pressure and felt like we had more flexibility". The programme goals were that teachers help students improve their achievement: there was no imperative for a teacher to cover any particular ideas independent of their assessment of student needs. Students also mentioned this point. It was best summarised by the teacher who advised, "You can't rush the progress".

> After the pre-testing, analysing the data and planning what you'd like to cover, be flexible and change to meet the needs of the students. I initially wanted to cover a bit of everything. However, after a few weeks I realized I'd rather spend time on areas that seemed more important instead. You can't rush the progress.

> Time for sharing and students taking turns recording their strategies in the modeling book while another explained. Reflection time in their maths books so they could think about what they had learnt and what went well. Lots of real-life problems to solve.

Helping students see connections and the big picture

The 'lightbulb' or breakthrough moments in student thinking that the teachers described focused heavily on students suddenly seeing the bigger picture or wider patterns involved in mathematical thinking. Some examples were:

> One of my boys said, "Oh so you can move a number around and still get the same answer" eg, 9+4 = 10+3 ... this helped in all areas of his thinking. Another one of my boys realised that there are almost patterns to everything and that he just needs to look for them and remember them ... this helped him straight away. (AliM)

> One of my students was confident working with numbers up to 20 but struggled with the bigger numbers. One day his face lit up and he said, "it's the same thing as making 10!" (28+32) when he finally saw the pattern to 10 in the bigger numbers. It was a great motivator for him.

A variety of activities and equipment to develop and express learning

Teachers and students, when describing what was effective from their point of view, listed a range of interconnected and mutually reinforcing activities as indicated in the comments below. Teachers used a range of means to probe student thinking and to support them to express and progress their thinking.

> I realised that just because they give the 'right' answer it does not mean they 'know' it and you need to be careful, as four of my children were ESOL. I realised you should never assume what they are thinking; they need lots of visual aids, explicit teaching, and opportunities to explore the concept.

> … working in the same dedicated space using the same lesson structure is important for the children who are English second language learners. I introduced new vocabulary and reinforced this by singing mathematical rhymes as a low risk opportunity to practice sounding out the words. I used dance, books and poems to help the children conceptualise the mathematical ideas. Each child had their own goal sheet and they checked the goal sheet themselves to see how they were achieving their goals.

The involvement of family/whānau

Engaging family and whānau is a core component of culturally responsive pedagogy as part of teachers getting to know their students. In the pre survey, nearly all ALiM and SMT principals stated they planned to involve the families of the children with the programmes. In the post survey, a majority of ALiM and SMT teachers (75 per cent; 70 per cent) reported that parents had been supportive of their child's participation in the programme and a number identified support from home as a factor that contributed to some students making a lot more progress than others. Teacher descriptions of how they had involved families/whānau indicated that many had gone to considerable lengths to inform parents/families about student participation and to provide them with regular updates on their child's progress, for example, via phone calls, email and notes sent home. Some teachers (around a fifth) had invited families/whānau in to watch the group at work and/or to maths evenings. The following comments illustrate the breadth of approaches teachers used to engage with families/whānau. Several techniques incorporated the use of information and communications technology, such as blogs, email and websites.

> Held an information evening to explain the project and the strategies with follow up letters. Created a Blog for children to share their learning.

> All parents were invited to come along to sessions and join in if they wished. Children took home a reflection book every Friday, which they had reflected in. They also took home a letter detailing what

> we had done in the last week and how parents could assist them and a new maths game to play with their family.

Involving and/or communicating more with families/whānau throughout the programme was something that around a fifth of the ALiM teachers identified as a change they would make if they were to teach the programme again. Their identification of this point adds weight to the value of parent/family/whānau participation in the programme. Comparisons of students' achievement did not yield any significant differences, in either scale-scores change or in the percentage of yearly growth analysis for either ALiM or SMT students, in relation to the level of family involvement in the project.

Case study teacher descriptions of their teaching practices

ALiM case study teachers provided extensive descriptions of the teaching approaches they used. These included clear expectations for student learning and success and support for discussion, for example:

Case study school 11 (Decile 3): To the teacher in this case study school stated it was important that the school was 'culturally there'. The population was diverse and the school had worked hard to ensure that it was inclusive of all cultures. The children in the programme were refugee children. The teacher worked with a support person, who was a member of the school community but employed by an outside agency to assist refugees to integrate with the community, to help her understand what and if the children were learning. The translator talked with the children about their learning in their own language outside the programme. The teacher placed emphasis on student goal setting and goal achievement and provided ample opportunities for the students to develop listening and cooperative learning skills. The students used their maths scrapbook to show and talk to the researcher about their learning progress. The teacher's reflective journal included photographs and comments on what she had learned and what the children had done and learned indicating that her planning was carefully crafted to target her students' needs and interests.

Case study school 6 (Decile 1): The case study teacher reported that the school had spent time developing culturally responsive policies and practices that included a culture of learning and 'home-life' relationships. The school was 95 per cent Māori. The teacher was not the children's regular teacher but the school was relatively small and she knew all the children prior to teaching them for the programme. She used materials, physical activities and singing and movement during the sessions. She had chosen not to send work home so as not to overload the children—she could not be sure what homework the children's class teacher had assigned.

Case study school 10 (Decile 1): In a third case study school the teacher indicated that her pedagogy was responsive to children's learning preferences. For example, she enabled the children to choose the way they solved problems. She made available a range of materials, pens for whiteboard working were readily accessible, there was a floor space where the children could lie and work. There were large scrapbooks for the children to record their ideas. In the beginning the teacher often used a 'speaking frame' (an idea from the Reading Recovery teacher) to help scaffold the development of children's mathematics language so they could access the mathematical ideas. She considered that as a consequence, the children learned to articulate their ideas and to work and strategise together in alternative ways.

Student experiences of the teaching

Students were asked to rate the helpfulness for their learning of a number of factors, including them talking with the teacher and a buddy, working by themselves, using equipment and having more time to think. On the whole, the ALiM and SMT students positively rated or were neutral about all the factors listed in the pre-survey, and rated the same factors more highly in the post-survey. The factors to do with interaction were rated highly by all student sub-groups pre and post the programme. Further analysis indicated there was a significant difference between New Zealand

European and Māori and between New Zealand European and Pasifika students in the post-survey in relation to the benefit they attached to working with the teacher. On the whole, Māori and Pasifika students rated working with the teacher more positively. There was no significance between the Māori and Pasifika sub-groups of students on this factor. The use of equipment was rated highly by all ALiM students in the pre- and post-survey, with a mean shift for the whole group from 1.93 to 1.43 (towards the positive end) and no significant variation amongst student groups.

SMT student responses paralleled those of the ALiM students in terms of benefits accorded to interaction and equipment use but the New Zealand European students were more positive about working with a teacher than were Māori and Pasifika students. Students from all groups and both programmes also shifted to rate working by themselves more highly in the post-survey (means 1.69 to 2.04). While the value students attributed to interaction and to time to work by themselves might seem contradictory, there was evidence in students' responses about what was different and what they liked about their mathematics groups that affirmed both were of value.

When asked what they had done differently and liked, around one-third of ALiM and SMT students simply listed the mathematics they had learned, such as fractions, place value, writing "long" numbers, how many tens there are in a number, number lines and so on. After this the most frequently mentioned aspect that was different and appreciated was playing games, which was linked with mathematics being enjoyable, purposeful and having an element of motivating competition. The next most frequently mentioned point was using equipment/hands-on activities. This was reported as an activity that distinguished the programme from classroom lessons by about one-quarter of students across both programmes. Working in a small group was mentioned as something different and as something that was of value by around a sixth of students, as was having quick, easy and safe access to a teacher, and having sufficient time to think through ideas.

> If I don't understand something I can ask and get more understanding of how to do something. (SMT)
>
> It was better because I learnt things and could answer straight away.
>
> We work as a group and if somebody gets a question wrong nobody laughs at each other. They also help us to understand the work when we get in our groups.
>
> You don't sit down with five or more people and they don't always go over and you don't always understand what they are saying, but at the maths group we do all these things.

The following points were mentioned by at least ten students. They are detailed here because they provide further insight into student experiences and preferences.

- Students enjoy challenging work:
  - with Mr X, I like the way we are doing big numbers
  - I like doing the times tables and I like the games and I like learning harder stuff, like those hard take-away questions
  - learning big numbers that I haven't learnt before and it's been EXTRA fun.
- Students recognise and appreciate it when teachers scaffold their learning
  - I like how you started with the little pluses and then got higher and higher. Easy to hard. You give us more time. Was good talking to others about what I was learning but at the right level for me.

- Teacher pacing to provide time for students to fully understand an idea is important
  - I like that you can ask anything about maths and our teacher will answer the questions and if you don't understand it she will go over it again until you do understand it. I like that I have gone up in maths and I feel much better at maths and I know I am much better at maths.

A note of caution is needed with these findings because it is possible that the students took for granted many of the aspects that were of interest as relevant to effective teaching and learning and so did perceive them as worthy of mention. Moreover, asking students to comment on what was different and what they had liked required them to reflect on and be meta-cognitive about their experiences. That so, many students were willing and able to do this lends weight to teacher perceptions that the students valued their participation in the programme and were keen to learn when given the time and support to do so. It also challenges any sense that these students who had been assessed as performing 'below' or 'well below' National Standards might lack the motivation and/or some of the skills to achieve.

4.6 The sustainability of positive programme effects

It is of educational importance that the increased learning in these mathematics programmes be maintained beyond the duration of the programmes. With regard to individual students, a number of teachers reported that students had sustained newly found confidence, such as being prepared to share and talk about their ideas into the classroom. Teachers and principals expected that students would maintain the gains made during the programme and anticipated that they would sustain the same rate of progress. Case study principals and teachers expressed an interest in monitoring the extent to which their students sustained gains made once they returned to their usual classroom programme.

Programme teachers indicated that the knowledge and expertise gained from their experience of working with a small group had already informed their classroom programme. They planned to continue to implement insights developed with their classes. In addition, most teachers had shared what they had learned with colleagues. Teachers considered that the mathematics programmes were 'value for money' in comparison with, for example, Reading Recovery, because the teacher worked with a number of students rather than one 'fragile learner'. Nonetheless the programmes were demanding of staff time and commitment. A number of teachers expressed a strong intention to ensure that what they had learned through the programme would become general school practice.

Schools were encouraged by the Ministry of Education to spread any positive outcomes from the programmes to other parts of the school. All principal respondents reported that they planned for the intervention teacher to share effective teaching practices with other teachers and to link lessons learned from the intervention to the school's classroom programmes more generally. This intention could be taken as the principals viewing participation in the programme as involving a school-wide commitment with the potential for school-wide positive outcomes. In the post-survey, 70 of the 81 ALiM principal respondents to this question and 18 of the 19 SMT principals reported that the intervention teacher shared ideas about the mathematics intervention with other teachers. These findings indicate that from a principal point of view teachers had had opportunities for wider sharing.

Nearly all of the ALiM teachers (92 per cent) reported they had actually been able to share their learning or experience from the mathematics programme with other teachers across the school. Just over two-thirds had been able to share 'some' of their learning and just over one-fifth had been able to share 'a lot' of their learning. Seven had not shared their learning and one teacher did not respond to this question. A similar pattern applied with SMT teachers, with all but one saying they had been able to share their learning with colleagues and seven out of 26 saying they had shared a lot their learning. Closer liaison with the classroom teacher and generating/taking advantage of more opportunities to share their learning was a focus for a number of teacher comments on what they would do differently next time.

ALiM principals considered that the sharing had positively influenced other teachers across the school (56 per cent) teachers in syndicates (47 per cent) students across the school (17 per cent) and students in the classroom(s) of the intervention students (37 per cent). SMT principals reported a more extensive impact, perhaps indicative of the longer timeframe of the intervention, the greater numbers of students involved and that it was likely to be a second-year iteration of the programme for some schools. Other teachers across the school were thought to have been positively influenced by 16 of the 19 principals as had been teachers in syndicates (68 per cent) students across the school (37 per cent) and other students in the classrooms of the programme teachers (42 per cent).

At the beginning of the study some principals reported they had entered the programmes because raising the attainment of low achieving students was a strategic focus. In some schools it appeared that teachers as a learning community were coming together to focus on promoting the learning of students who were performing below expectations. Some case study school principals had plans to continue to explore ways of achieving a wider impact in the school.

Teacher commentary indicated that the planning and expo days may have acted as catalyst for a cross-school learning community, with a shared interest in the students the programmes targeted. Teachers were interested in what others had done and the different impacts of different teaching approaches.

4.7 Conclusions from the mathematics programmes

This evaluation examined the extent to which the 10-week ALiM and 15-week SMT mathematics programmes accelerated student learning and what teaching approaches contributed to greater achievement. At the start of the programmes there was general optimism among principals, teachers and students that student achievement would be accelerated. The results of achievement tests confirmed that, on average, students did accelerate their learning but there was some variability across the whole group for each of the two programmes and for each of the three sub-groups (New Zealand European, Māori and Pasifika). However, the differences were not statistically significant. The programmes were effective in accelerating the attainment of all student groups to a similar degree, irrespective of their starting point.

Conclusions from student achievement data

Both programmes were successful in accelerating student achievement as determined by group measures.

In ALiM, all the students and students from the New Zealand European, Māori and Pasifika sub-groups made accelerated progress as assessed by PAT patm scale scores and percentage of usual yearly growth. Year 4 students made the greatest mean scale-score gains suggesting that this Year was a productive target for the programme. However, Year 6 level made the greatest percentage yearly growth as compared with gains found by Darr et al. (2009) suggesting the programme was well timed for the participating students. In terms of effect size, the improvement was substantial (see Fashola & Slavin, 1998); it was similar for the Māori and Pasifika sub-groups and greater for these groups than for the New Zealand European student group. NumPA results showed that the majority of New Zealand European, Māori and Pasifika students made statistically significant gains in Number Framework stages during the period of the programme, and compared with gains reported in the Numeracy Development Project (Young-Loveridge, 2010) their learning was accelerated. On average, ALiM student achievement increased by around one stage. Around a fifth of students gained two stages and a small proportion gained more than two stages (3 per cent). Across all domains, New Zealand European, Māori and Pasifika students experienced accelerated growth when measured in average growth in scale scores. Pasifika students recorded the greatest, but not significant different, gains in all domains. Well over half the students completed the programme at Stage 5 or above on each domain in the Numeracy Framework, a substantive achievement given they were predominately in Years 4, 5, and 6.

For SMT, all students and students from New Zealand European, Māori and Pasifika sub-groups made accelerated progress, as assessed by PAT patm and percentage of usual yearly growth. In terms of effect size, the improvement for each sub-group was similar and substantial (see Fashola & Slavin, 1998). The NumPA results showed that the majority of New Zealand European, Māori and Pasifika students made statistically significant gains in Number Framework stages during the period of the programme, and compared with gains reported in the Numeracy Development Project (Young-Loveridge, 2010) their learning was accelerated. On average, students' achievement increased by around one stage. Almost one-quarter of students gained two stages and a small proportion gained more than two stages (4 per cent). Across all domains, in terms of average growth in scale scores, New Zealand European, Māori and Pasifika students experienced a similar rate of growth. Post the programme at least half of the students were assessed as at Stage 5 or above in all of the Numeracy Framework domains, a substantial achievement given that two-thirds of participants were in Years 4, 5, or 6.

Overall, it appeared that schools had selected students who would benefit from an intensive programme. The majority of students had accelerated their learning over the period of the programmes to an extent beyond that which could be expected in a regular classroom programme.

Programme implementation models

The programme models within the schools were analysed as having these elements: clear principal and teacher commitment to the goals and success of the programme; principal and teacher understanding of responsive pedagogy; careful selection of the teacher and students; provision (in most instances) of a dedicated teaching space, and productive use of teacher release time. The prevailing view was that the programmes were an opportunity that was too good to miss out on. For some principals it was important that the programme fitted with the school's strategic plan.

Teacher and student selection were thought to be important. Some principals pointed out that an effective teacher was required, given the focus was on accelerating student learning and this required expertise beyond that which could reasonably be expected from a teacher's aide. Given teacher descriptions of the need to review their learning intentions and continually refine their teaching approaches, the focus by some principals on teachers being prepared to adjust their teaching is likely to have been important. A group size of 5–8 was reported to be effective, with teachers recommending that student selection consider student ability to contribute in a small group and restrict the range of initial student learning needs.

Comparisons of student achievement based on the frequency of mathematics classes did not yield any significant differences in either scale-score change or in the percentage of yearly growth analysis for either ALiM or SMT students. Duration of sessions did not influence SMT students' achievement in any systematic way. However, ALiM students who were taught for more than 30 minutes experienced a significantly greater increase in scale scores and in the percentage of yearly increase than the students who were taught for less than 30 minutes.

Most principals provided leadership for the provision of support for the programme teacher and there was evidence from survey responses that teachers valued their principal's support either directly or by arranging support from other teachers, facilitators and sometimes from external personnel. In SMT schools whether the teacher was supported by the principal or not had no bearing on the students' change in scale scores or the percentage of yearly increase. However, in ALiM schools, students whose teachers had the principal's help experienced a significantly greater change in scale scores and yearly increase analysis than students whose teachers did not have this help.

Analysis of other organisational factors, such as release time for teachers, separate space, teaching resources, extra lessons and professional development for teachers provided by principals did not reveal significant differences in

students' achievement. Although trends towards significant differences favouring these factors in students' improvement were observed, the differences did not reach statistical significance. Nevertheless, through observations and interviews in case study schools and comments in the survey it was clear that these organisational factors were viewed as making a positive difference to teaching.

A number of principals had taken steps to ensure teachers shared their experiences with other teachers, although the extent of the sharing varied. Some case study school principals had plans to continue to explore ways of achieving a wider impact in the school.

Pedagogical approaches

Programme teachers used a variety of teaching approaches and made considerable use of discussion, equipment and games. They paid attention to the development of a positive learning environment. They used and advocated close monitoring and planning day-to-day to respond to student needs as they emerged.

In the pre-survey and case study interviews most teachers described aspects of teaching that are recognised as effective and responsive. Teacher comments to do with learning with and about, their students suggested they were well disposed to the principles of culturally responsive pedagogy and its associated practices. Post the programme, some teachers reported their orientation was on the mathematical learning needs of each student and so they did not make changes specifically for Māori and Pasifika students. Other teachers described how they had adjusted teaching to accommodate the interests of their Māori and Pasifika students. Teacher actions included, for example, building relationships in a safe environment; having high expectations that they (teachers) verbalised and reinforced; encouraging and supporting students to articulate or demonstrate their thinking and creating problems centred on contexts that were familiar and meaningful to their student group.

Teachers reported that a majority of families/whānau of students were supportive of their child's learning within the programme and some teachers went to considerable effort to maintain ongoing communication with families/whānau. Family support was identified as a contributor to students success by some but not all teachers.

There was a consensus across survey and case study teacher data that there had been a noticeable change in participant students' attitudes and sense of themselves as learners that had translated into increased confidence and willingness to share their ideas and take risks in the regular classroom programme. Case study teachers indicated their experience in the programme had been an "invaluable learning experience". Survey comments also suggested that a number of the teachers had shifted in how they thought about students' mathematical learning potential and their own approaches to effective teaching and learning.

Student experience

Most students had enjoyed their time in the programmes. Many identified the concept focus and the activities they did in their group that had helped their learning. They identified there had been more discussion with the teacher and their peers, they used more equipment and played more interactive mathematical games. Some students, and teachers, reported that within the small group students had no option but to participate, with this seen as a positive factor in the supportive environment the programme offered. Students reported they had gained in confidence and motivation and considered they had learned better in the intervention group than in their usual classroom. This seemed to be related to students being able to focus in on the mathematics, free of distraction and interruption and with easy access to the teacher. Nearly all students provided a more positive rating of their mathematical capability after the programmes.

Sustaining the programme

Teachers reported as a success students sustaining the confidence and skills they demonstrated in the programme lessons into their classroom learning. Teachers had adjusted their classroom programmes to take into account what they had learned through their intensive interaction with a small group of students. Teachers were eager to share and most principals had provided opportunities for them to do this. In some cases, it appeared that a learning community was developing focused around raising the achievement of students who were achieving below expectations. This community was able to build evidence that this was possible.

Recommendations

Taking a broad view of the mathematics programmes, success indicators from the evidence in this evaluation include: principal support and organisation for the enactment of the programme; careful teacher and student selection (possibility with preference given to Year 4 students); provision of a separate teaching space, resources and support; time for teaching planning and reflection; responsive planning linked to formative assessment, with at least four lessons per week in the 30-60 minutes range; time given for students to thoroughly understand ideas; and extensive opportunities to talk about ideas. The planning days and expo were important in establishing a wider community of interest in the achievement of students who are achieving 'below' the National Standards.

5 Discussion and Conclusions

This report outlines the results of an evaluation of programmes in literacy and mathematics that were designed to accelerate the learning of students who were 'below' or well below the National Standards. Programmes in reading and writing were run for the 10 weeks of Term 3, 2011. Programmes in mathematics were ALiM (additional learning in mathematics) that ran for the 10 weeks of Term 3 and an SMT (Specialist Mathematics Teacher) programme that ran over 15 weeks from the start of Term 3, 2011. In each school, students were taught either as a withdrawn group or as individuals or a group in their regular classroom. This discussion is structured on the research questions of this evaluation.

5.1 Student achievement

This evaluation looked at the extent to which the programmes in reading, writing or mathematics accelerated learning for all students and for three ethnic groups, New Zealand European, Māori and Pasifika. The results by group mean scores for the various assessment measures are that the overall groups of students in reading, writing and mathematics improved their scores to a level that could be considered accelerated. That is, their achievement increased by more than would be expected in the equivalent time in regular classrooms.

Each of the New Zealand European, Māori and Pasifika sub-groups of students made accelerated progress in terms of group mean scores and all increased by about the same amount. Thus, the programmes can be said to have been successful for these groups.

In *reading achievement* all three ethnic groups significantly improved their scores for all categories of the Observation Survey, instructional reading levels (Colour Wheel) and OTJ ratings against the National Standard. In writing, group means for asTTle and Overall Teacher Judgement were evidence of accelerated learning. By the end of Term 3 the *writing achievement* of the three major ethnic groups (New Zealand European, Māori, Pasifika) improved, on average, by at least one level on the asTTle test. Overall Teacher Judgement was that all three ethnic groups improved comparably in each year, and the majority accelerated their writing learning.

The ALiM student group as a whole, and each of the ethnic sub-groups, made accelerated progress as measured by change in their average scale scores and percentage of usual yearly growth in PAT. Students in Year 4 made the most growth as measured by gain in average PAT scale score. Māori as a sub-group made the most growth as measured by scale score but the effect size was similar to that of Pasifika students. The effect size for New Zealand Europeans was lower. At the beginning of the programme a majority of students were at Stages 4 or 5. At the end of the ALiM programme the majority of the students were at Stages 5 and 6 on the NumPA Framework. The average increase in Stage ranged from just under to just over one stage across all domains, which represents a greater than expected growth in the time period of 10 weeks, as compared with the Numeracy Development Project findings. It is noteworthy that students made progress across all domains, given that teachers at the planning days indicated they planned to focus on only one or two domains. ALiM students who were assessed at a lower stage on the Framework made more progress. NumPA results indicated that, on average, New Zealand European, Māori and Pasifika students progressed by the same amount, irrespective of their starting point. Pasifika students made the most average scale score gain in each of the domains and their final average score was the highest, irrespective of their relative starting point. The relatively low percentage of students experiencing negative gains in Years 4 and 5 suggests that the programme is likely to have optimal impact with students in Years 4 and 5.

The SMT students as a whole made accelerated progress as measured by change in their average scale scores and percentage of usual yearly growth in PAT and by NumPA Stage change. At the beginning of the programme a majority of students were at Stages 4 or 5. At the end of the SMT programme the majority of the students were at Stages 5 and 6 on the NumPA Framework. The average increase in Stage ranged from just under to just over one stage across all domains, which represents a greater than expected growth in the time period of 15 weeks as compared with the Numeracy Development Project findings. Students at lower stages, on average, made more gains. Students in the New Zealand European, Māori and Pasifika sub-groups experienced a similar effect size. Students in all sub-groups recorded the same amount of progress across the NumPA domains, irrespective of the starting distribution.

Analysis of achievement scores for reading, writing and both mathematics programmes indicated that at the individual student level, scores varied from accelerated to no progress to a decrease in achievement measures. This was the case for around a fifth of students across all programmes. It is not possible to explain this matter; findings could be an artefact of the assessment process and tasks and/or students may have gone backwards in their understanding. For multi-choice tests, research has shown that students can go backwards for a while after teaching that challenges their ideas.

These achievement results are consistent with a high level of expectation that principals and teachers had before the programmes began that student learning would increase more than it usually would in the equivalent time. The results suggest that schools had identified students who would benefit from the programmes and the programme had worked for them

5.2 Pedagogical approaches

The evaluation sought to identify the nature of the teaching and learning the students had experienced and which particular teaching approaches and activities had the most impact on student learning. How well the teachers designed and enacted learning plans with students with a specific focus was the extent to which teachers pedagogical practices could be said to be culturally responsive and tailored to the needs to their student group, and Māori and Pasifika students in particular.

Planning for responsive teaching

At the planning days prior to the start of the programmes teachers were briefed on the need to design and teach programmes that responded to students' specific reading, writing or mathematics needs. This evaluation found that most teachers did design and enact learning plans in very effective ways. The planning of reading and writing teachers was informed by time in the planning days to share with other teachers. In their schools these teachers continued the planning process and were usually supported by at least one colleague. Teacher survey responses indicated that many of them had moved from longer-term intentions to shorter-term planning as they came to understand and respond to their student needs. The mathematics teachers rated planning as an important factor in the success of the programme. Their planning was systematic and linked with their teaching. There is international evidence that teaching has to be systematic for early struggling readers and this would also apply to writing and mathematics (Lyon & Chhabra, 2004; Carnine, Silbert, & Kame'enui, 1997; Vaughn, Denton, & Fletcher, 2010). Torgesen, Wagner, Roshotte, Rose, Lindamood, et al. (1999) found that students who received explicit instruction demonstrated significantly greater growth across early literacy measures than those in less explicit instruction.

There was ample evidence from teacher survey and case study comments that teachers quickly realised that it was necessary and valuable to plan from day to day, as well as longer term, using evidence and insights from one day to inform the next steps for teaching and learning. The mathematics teachers were asked to keep a reflective journal and reading and writing teachers a record of teaching and a number of comments attested to the merits of daily reflection on

their teaching and student responses to inform their actions. Planning became an iterative adaptive process. Teacher sensitivity to these aspects can be seen to be indicative of the adaptive expertise they brought to the teaching (McNaughton & Lai, 2009).

Responsive teaching approaches

This evaluation probed to identify those attributes of the programme teaching that principals, teachers and students thought were effective. It also investigated understandings of, and the extent to which the espoused teaching was culturally responsive and teachers had changed their teaching to meet the needs of the students they worked with. Evidence from surveys and interviews with principals and teachers is that the teachers were familiar with and had used a range of teaching strategies that are generally considered effective for diverse learners (Alton-Lee, 2003; see also Anthony & Walshaw, 2009). These included responsive planning, fostering dialogue with the group, creating a safe learning environment, using a variety of activities to illustrate and develop the same concept and spending an extended time on the same concept to ensure it was fully embedded. It was not possible to isolate the influence of any one of these strategies, teachers used them and students spoke about them, in combination.

For reading, there was reasonable consistency between the views of teachers and students about the teaching and learning. Teachers reported that they were more effective because of the extra time they could spend with their group and with individual students to respond to their specific reading needs. The time allowed them to get to know, in detail, what each student knew and what activities would help advance learning to read. Students gave examples of being able to talk more about shared stories, read more books, improve their skills of reading, choose some of the books and spend more time reading to the teacher.

For writing, similar comments can be made about consistency between teacher and student views. Both teachers and students saw benefits in being able to spend more time on discussion about writing topics and skills, sharing writing in the group, tracking individual writing progress and practising writing skills. Students liked the continual teacher feedback and most could track their own progress. In ethnically diverse groups, teachers were usually responsive to cultural background in the topics for writing.

For mathematics, teachers and students in both the survey and case studies indicated they valued the opportunity for more indepth discussion of ideas with the teacher, a buddy and in the small group. They endorsed the use of equipment, relevant tasks and games because they provided rich and varied ways for students to encounter ideas and to develop and express their understandings. Teacher descriptions of effective practices highlight the role of adaptive planning, close listening to students, taking the time to fully embed ideas and the use of a variety of activities. Students said they valued games and working with peers; games often provided a motivating forum for the joint exploration and development of knowledge and strategies.

Presentations at the pre-programme planning days elaborated the tenets of culturally responsive pedagogy although teacher commentary suggested that culturally responsive pedagogy was not a well understood term. Nevertheless, in their pre-survey responses the teachers described beliefs and practices that are generally identified with pedagogy that is culturally responsive. Most teachers reported that in the programmes they taught in much the same way as usual with specific adaptations to suit the needs and interests of particular students, constantly fine tuning activities and their approaches to be more effective. That is, they responded to the particular needs of their students emphasising some aspects, such as encouraging more discussion in their student writing group about a writing by topic to prepare for the writing task and providing more opportunities for talk and time in the mathematics group for students to fully understand concepts before moving on.

Responsive teaching approaches for Māori students

Teachers had mixed views about how much they changed their teaching approach to better suit Māori students in their group. On the one hand, many teachers reported that they tended to teach all students in the group in a similar way, including any Māori students. Given the recommendation that principals select teachers who were already working in culturally responsive ways, this stance may not be unreasonable. Teachers claimed there are certain basic teaching approaches that are effective with all students and that any changes were specific to individual students rather than to a student as a member of a particular group. On the other hand, it was clear that teacher claims that they did not adapt their practices was meant in general terms because many teachers reported how they had, indeed, changed specific aspects, such as letting each child choose writing topics that interested them and choose more relevant reading books; encouraging students to use their first language in group work, taking care to find out about their students' lives as part of establishing positive relationships with their Māori students and to provide time for collaborative work.

Responsive teaching approaches for Pasifika students

Teachers' teaching of Pasifika students can be described in similar ways. Examples of how teachers accommodated the needs and strengths of their Pasifika students included choice of reading books and writing topics that linked to students' cultural backgrounds, mathematics problems set in contexts that were familiar to students and encouraging students to use their developing language skills to share and extend their thinking.

Student perceptions

Nearly all students reported positive experiences in the programmes. As pointed out above, many students were able to identify particular strategies and learning skills that had been emphasised and helped their learning. Many could also identify activities they did in their groups (or with the teacher in some reading and writing settings programmes that were taught in the students' in regular classrooms) that helped their learning. These included opportunities to talk with the teacher and peers, to work with no distractions, to choose to use a range of materials and prompts to help them express their thinking. Many of the activities that students identified as being different from their usual class work were more a matter of degree. For example, students reported that their programme teacher often put more emphasis on aspects such as timely teacher feedback and forward, reading more books in reading, sharing more of their written stories in writing or using more equipment and games in mathematics.

Surveys and interviews showed that most students' attitudes towards reading/writing/mathematics became more positive. Their enjoyment of reading or writing or mathematics rose, they became more confident and engagement and motivation grew. In case study schools most students liked their programme teacher and there seemed to be a link between liking the teacher, their enjoyment of the programme and their motivation to learn.

5.3 Success factors

The programmes were set up with a tight focus on raising the achievement of students who were assessed as being 'below' or well below the National Standard for their Year level in reading, writing and mathematics. Schools were advised to select an effective teacher who was experienced in working in a culturally responsive way and with a demonstrated ability to raise the achievement of at-risk students. The recommended group size for ALiM mathematics was five to 12 students, for teaching sessions of 20 to 40 minutes at least four times per week. Group size and lesson frequency for reading and writing were left up to schools to decide. Teachers of reading, writing and ALiM mathematics were provided with 15 days of teacher release time. ALiM teachers were provided 10 hours external support. SMT teachers were provided with 0.5 full-time equivalent (FTE) teacher release time for the 15 weeks of the programme and 20 hours external support. Teachers in the mathematics programmes were asked to keep reflective journals and required to lodge student PAT and NumPA data at the beginning and end of the programme. All teachers were expected to attend two initial planning days and to present their approaches and student results at an Expo day at the end of their programme. Taking account of these parameters, the evaluation sought to identify the factors that contributed to the success of the programmes in terms of student achievement and teaching approaches.

School and teacher understandings of the goals of any policy initiative are important (Higgins & Parson, 2011). Schools were provided an overview of the goals and structure of the programmes and presentation on culturally responsive pedagogy and, in the case of ALiM teachers, effective pedagogy for mathematics learning. The planning and training days run by the Ministry of Education prior to the programmes were regarded by most teachers as an effective way of briefing them on the aims of the programmes and for them to meet with teachers from other schools to discuss teaching approaches. Principal and teacher comments indicated they clearly understood that the aim of the programmes was to raise the achievement of a small group of selected students within the specified period; and they held high expectations of student success. Many teachers reported they were expecting to be given specific directions about teaching approaches at the planning days. They found this was not the case; instead there was encouragement to be confident in their own successful teaching approaches and to adapt them to the needs of the programme students. During their teaching, as evidenced in case study school interviews, all teachers seemed to have taken up the opportunities this high trust approach allowed them, that is, to use their own initiatives in their teaching approaches. There were some indications that because teachers were expected to attend the planning and Expo-reporting days and to provide data on student achievement student success within the programmes became a whole-school priority and responsibility.

Principals were important sources of support to most of the reading and writing teachers. There were examples of the programmes being given priority over other school events and indications that in some schools student achievement was viewed as a school-wide responsibility. Principal pre survey comments indicated that they had been proactive in ensuring that programme teachers had the resources and support they needed, where this included allocating the support provided by the Ministry. Most principals provided opportunities for programme teachers to share what they were learning with others.

Principal support in prioritising and providing organisational support for the programme was said to be important by most teachers. Principals often arranged for the lead literacy teacher to mentor the reading and writing programme teachers. Principal support correlated with student achievement in reading, writing and ALiM programmes but not the SMT programmes. Given that many of the SMT schools had previously been ALiM schools this suggests that principal support is particularly important in the first iteration of a programme in a school.

Principals reported they had selected effective teachers, with known expertise in raising the achievement of student learning and who would be prepared to change their teaching to meet student needs as they emerged. Teacher post-programme descriptions of effective pedagogy were generally similar to their pre-survey comments suggesting the

teachers were, as had been required within the programme, effective practitioners with the skills to work successfully with struggling students. Nonetheless, a number of teachers indicated their experience of working intensively with a small group of students had challenged and extended their thinking on how to support student learning and what students could achieve. They explained that this was because they had been able listen carefully to students with the time and freedom to focus on meeting their needs.

Programme design relied on having effective teachers. Teacher comments in the pre-survey indicated that, as a group, they were aware of the tenets of effective teaching and had an appreciation of the principles of culturally responsive pedagogy, even though planning day and case study comments indicated it was not a term many were familiar with. Findings from the post survey reinforced that teachers had appreciated the aspects of effective pedagogy. Teachers attributed value to, and reported frequent use of, the effective responsive practices listed in the survey. Their descriptions of the three most effective practices further attested to their adaptive expertise. Teachers gave descriptions of the need to review their learning intentions and continually refine their teaching approaches. Therefore, teacher selection was linked to them being prepared and having access to the resources to adjust their teaching.

On the whole, programme teachers had more than five years teaching experience. Reading teachers of more than 10 years of teaching had higher student achievement in instructional text reading levels, although the sample number was small. No other links were found between years of teaching experience and student achievement.

The guidelines for the programmes indicated that participating students were to be 'below' or well below the National Standards and schools had prioritised this factor. However, students were also selected on the basis they would benefit from a short intensive programme, would be able to work in a group and were regular attendees at schools. Raising the achievement of Māori and Pasifika students was listed as a factor by some and not all principals, which likely relates to their student population and their assessment practices. Teachers recommended that to optimise student opportunities for targeted instruction, schools select students with a small of range learning needs.

Group size varied from three to 12 students. Teachers recommended 5-8 students. While one-to-one instruction may be considered by some to be the ideal, research has consistently shown that most students respond as well to interventions delivered in groups of one-to-three or one-to-five (Elbaum, Vaughn, Hughes, & Moody, 2000). Teachers and students endorsed that working in a small group allowed for timely and targeted teacher interaction and feedback. Student comments indicated that the small group setting was a safe and supportive environment for students to share and develop their ideas. Being able to work in a separate space with no distractions was seen as beneficial.

Teaching sessions of more than 30 minutes were associated with greater achievement in reading, writing and ALiM but not for SMT students. Teachers and students advocated that the teaching take place in a separate space so that teachers and students could give the task at hand their full attention.

The time made available for teachers to plan for, and reflect on, student learning and their teaching and to plan next steps was viewed as significant. Taking the time to plan and reflect from day-to-day was a strong theme in the advice teachers offered to other teachers in a similar programme.

The Ministry of Education guidelines given to schools stated the need for principals to ensure that programme teachers be given collegial support in planning and implementation. Teachers from all four programmes identified collegial support as a contributor to the success of their teaching programmes. Teachers sought out and received advice and practical suggestions from other specialist teachers and colleagues around their school. Some reading and writing teachers had sought support from outside the school from literacy consultants and advisors. Teachers in the ALiM and

SMT programmes valued the support of a facilitator or external advisor. Mathematics teachers commented that they made use of web-based resources.

As described in the section on teaching approaches, teachers built on and refined familiar effective teaching approaches within the programmes. Their descriptions of what had been effective indicated that within the small group they had been able to make fine-grained assessments and assessment decisions, to foster interaction and orchestrate respectful discussions that included the use of a variety of materials and relevant texts and tasks and be more responsive to student individual and group learning progress. It was notable that their descriptions of effective practice included a range of strategies, which combined led to student success.

Student perception that the programme was helping their learning was a strong theme of their survey responses. Case study students considered they were 'special' and were very aware of their accomplishments. Both of these factors likely contributed to the success of the programme.

Some of the teachers reported concerns about missing out on learning with their own classes and a small number of parents had commented on their absence. This would seem to be an issue when a highly effective teacher is withdrawn from a classroom programme. Teacher confidence in their reliever was important in ameliorating this concern. A few students expressed concern that they were missing out on classroom activities, especially those students who were not with their classroom teacher.

5.4 Sustaining the programme

Most teachers and principals were optimistic that students would sustain the progress made during the programme. Programme teachers had incorporated insights gained into student responses to different learning activities into their regular classroom programmes. The design of tasks and teacher interactions were informed by their more nuanced understanding of the variations in student thinking and approaches to learning particular ideas and strategies. There was evidence of some students sustaining their new learning and confidence to express their ideas into their regular classrooms and in other curriculum areas. There was evidence that many programme teachers kept in regular contact with the classroom teacher in those cases where the students came to the programmes from another teacher. There is international evidence that alignment can benefit learning. For example, Wonder-McDowell and Smith (2011) found that struggling Grade 2 readers (in USA) who were given extra teaching time made much more reading progress in programmes that were aligned with the classroom programme than students in non-aligned programmes. Reading skills of decoding, fluency, and comprehension improved significantly and showed the importance of the sequence and pacing of skills, strategies and concepts. In any future programmes in literacy and mathematics in New Zealand it will be important to plan to align the intervention programme and the classroom programme.

Principals had responded to the suggestion that positive outcomes from the programmes should influence what happens more widely across the school. A number of them saw the programmes as an opportunity to provide professional development for the programme teacher working alongside a specialist colleague, such as the Reading Recovery teacher. Staff meetings and teacher syndicates had been used as a vehicle for influencing other teachers across the school in terms of changing their classroom teaching to help students who are below learning expectations. Most programme teachers were enthusiastic about sharing what they had learned and had been able to share their experiences with school staff as a whole. As a group they were committed to maintaining the momentum of the programme as an impetus for change. Principals were of the view that the sharing had positively influenced other teachers. The possibility exists for schools to leverage the teacher expertise and collegial focus developed through their programme participation to further develop a learning community focused on raising the achievement of students who are achieving

below expectations. The planning and Expo day model offer the opportunity for this community to include a network of schools.

All principals who took part in the surveys were convinced of the worth of the programmes but most considered they find it difficult to run the programmes without additional funding, especially for teacher release. Many were looking for ways to provide some form of additional learning in their schools into the future. The teachers' commitment to use what they had learned with their own classes and to promote this learning to their colleagues would seem to provide some element of sustainability.

5.5 Concluding comments

Looking across the programmes it can be concluded that student achievement, on average, can be accelerated in reading, writing and mathematics when students are part of a short period of intensive small-group teaching with an effective teacher. Evidence from the Term 3 to 4 programmes was that New Zealand European, Māori and Pasifika students learnt a similar amount irrespective of their starting points in reading, writing, and mathematics.

Success can be seen to derive from an ensemble of factors, including:

- a clear goal (accelerating the learning of a small group of students achieving 'below' National Standards)
- Ministry resourcing to support a teacher to work intensively with the small group(s) of students (teacher release time; guidelines for teacher selection criteria, for student group size and session length; external professional development support (in the case of mathematics teachers))
- the need to report on and account for student achievement (attendance at planning days, the need to provide pre- and post-student data; Expo-reporting days, provision of a school report to the Ministry)
- trust in schools and teachers to expedite support for the teaching of the programme in ways that built on local expertise and resources
- teaching approaches that were modified and fine-tuned to be responsive to student individual and group needs, including the individual needs of Māori and Pasifika children
- teaching approaches that fostered and revolved around supportive relationships, promoted collective responsibility for progressing individual and collective learning, provided a safe environment for sharing and debating ideas and included a variety of relevant materials, activities and contexts
- student willingness to take up the challenge to learn and their sense of pride in their achievements.

Overall, teachers and students communicated the sense of empowerment as a result of their participation in the programmes. This shift appeared to be associated with an increase in teachers' sense of agency in knowing what their students' needs were and how to meet them. For students this came from their experiences of success. It is this sense of teacher empowerment that has the potential to sustain and scale the programmes more widely across and, potentially, between schools.

6. References

Alton-Lee, A. (2003). *Quality teaching for diverse students in schooling: Best evidence synthesis*. Wellington, New Zealand: Medium Term Strategy Policy Division, Ministry of Education.

Anthony, G., & Walshaw, M. (2009). *Effective pedagogy in mathematics.* Brussels, Belgium: International Academy of Education.

Bishop, R., & Gynn, T. (1999). Culture counts: Changing power relations in education. Palmerston North, New Zealand: Dunmore Press.

Bishop, R. (2012). A culturally responsive pedagogy of relations. In C. McGee & D. Fraser (Eds.), *The professional practice of teaching* (pp. 185–204). Melbourne, Vic, Australia: Cengage.

Bishop, R., & Berryman, M. (2006). *Culture speaks: Cultural relationships & classroom learning*. Wellington, New Zealand: Huia Publications.

Bishop, R., & Glynn, T. (1999). *Culture counts: Changing power relations in education*. Palmerston North, New Zealand: Dunmore Press.

Carpenter, V. M., McMurchy-Pilkington, C., & Sutherland, S. (2002). Kaiako Toa: Highly successful teachers in low decile schools. *SET, 1,* 4–8.

Carnine, D., Silbert, J., & Kare'enui, E. (1997). *Direct instruction reading* (3rd ed.). New York, NY: Merrill.

Coburn, C. E. (2003). Rethinking scale: Moving beyond numbers to deep and lasting change. *Educational Researcher, 32*(6), 3–12.

Darr, C., Neill, A., Stephanou, A., & Ferral, H. (2009). Progressive achievement test: Mathematics – Teacher manual (2nd ed.). Wellington, New Zealand: NZCER Press.

Elbaum, B., Vaughn, S., Hughes, M. T., & Moody, S. W. (2000). How effective are one-to-one tutoring programs in reading for elementary students at risk for reading failure? *Journal of Educational Psychology, 92*, 605–619.

Fashola, O., & Slavin, R. (1998). School wide reform models: What works? *Phi Delta Kappan, 79*(5), 370–379.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* London, England: Routledge.

Higgins. J., & Parson, R. (2011). Improving outcomes in mathematics in New Zealand: A dynamic approach to the policy process. *International journal of science and mathematics education*, *9*, 503-522.

Hill, J., & Hawk, K. (2000). *Making a difference: Effective teaching practice in low decile, multicultural schools* (Report to the Ministry of Education). Wellington, New Zealand: Ministry of Education.

Lyon, R. G., & Chhabra, V. (2004). The science of reading research. *Educational Leadership, 61*(6), 12–17.

McLaughlin, M., & Mitra, D. (2001). Theory-based change and change-based theory: Going deeper, going broader. *Journal of Educational Change, 2*, 301–323.

McNaughton, S., & Lai, M. (2009). A model of school change for culturally and linguistically diverse students in New Zealand: A summary and evidence from systematic replication. *Teacher Education, 20*(1), 55–75.

McGee, C., & Peter, M. (2011). *Evaluation of mathematics additional learning programme for students 2011: Numeracy project assessments (NumPA), Cohort 1*. Wilf Malcolm Institute for Educational Research, University of Waikato, New Zealand.

Ministry of Education. (2007). *New Zealand curriculum*. Wellington, New Zealand: Learning Media.

Ministry of Education. (2008). *Te Marautanga.* Wellington, New Zealand: Learning Media.

Ministry of Education. (2008). *Ka Hikitia—Managing for success: The Māori education strategy 2008–2012*. Wellington, New Zealand: Author.

Neill, A., Fisher, J., & Dingle R. (2010). *Exploring mathematics interventions: Exploratory evaluation of the accelerating learning in mathematics pilot study*. Report to the Ministry of Education. Wellington, New Zealand: Ministry of Education.

Neill, A., & Hodgen, E. (2011). *Exploring mathematics interventions: Further results from an exploratory evaluation of the accelerating learning in mathematics pilot study.* Report to the Ministry of Education. Wellington, New Zealand: Ministry of Education.

Robinson, V., Hohepa, M., & Lloyd C. (2009). *School leadership and student outcomes: Identifying what works and why*. Best Evidence Synthesis Iteration (BES). Wellington, New Zealand: Ministry of Education.

Torgesen, J., Wagner, R., Rashotte, C., Rose, E., Lindamood, P., Conway, T., & Garven, C. (1999). Preventing reading failure in young children with phonological processing disabilities: Group and individual responses to instruction. *Journal educational psychology, 91*, 579-593.

Vaughn, S., Denton, C. A., & Fletcher, J. M. (2010). Why intensive interventions are necessary for students with severe reading difficulties. *Psychology in the Schools, 47*(5), 432–444.

Wonder-McDowell, C., Reutzel, D. R., & Smith, J. A. (2011). Does instructional alignment matter? Effects on struggling second graders' reading achievement. *The Elementary School Journal, 112*(2), 259–279.

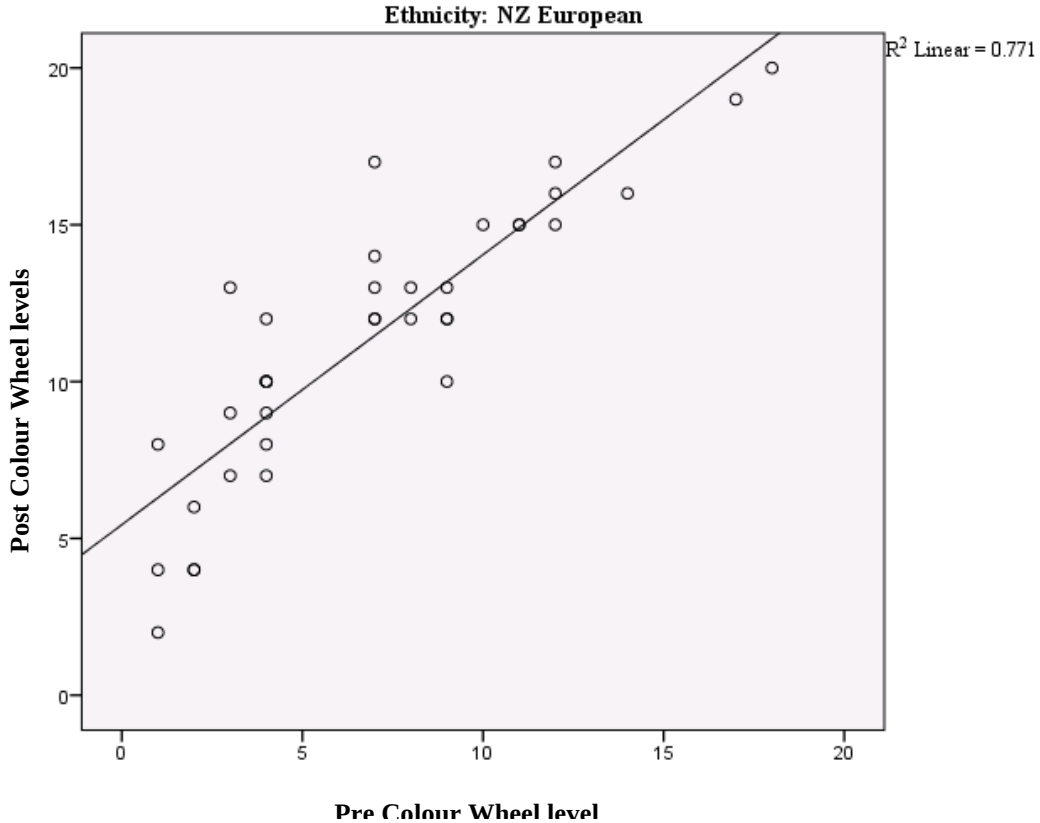
Young-Loveridge, J. (2006). Patterns of performance and progress on the numeracy development project: Looking back from 2005. In *Findings from the New Zealand Numeracy Development Project* (2005) (pp. 51–35). Wellington, New Zealand: Learning Media.

Young-Loveridge, J. (2008). What does the picture show? In *Findings from the New Zealand Numeracy Development Projects (2007)*. Wellington, New Zealand: Ministry of Education.

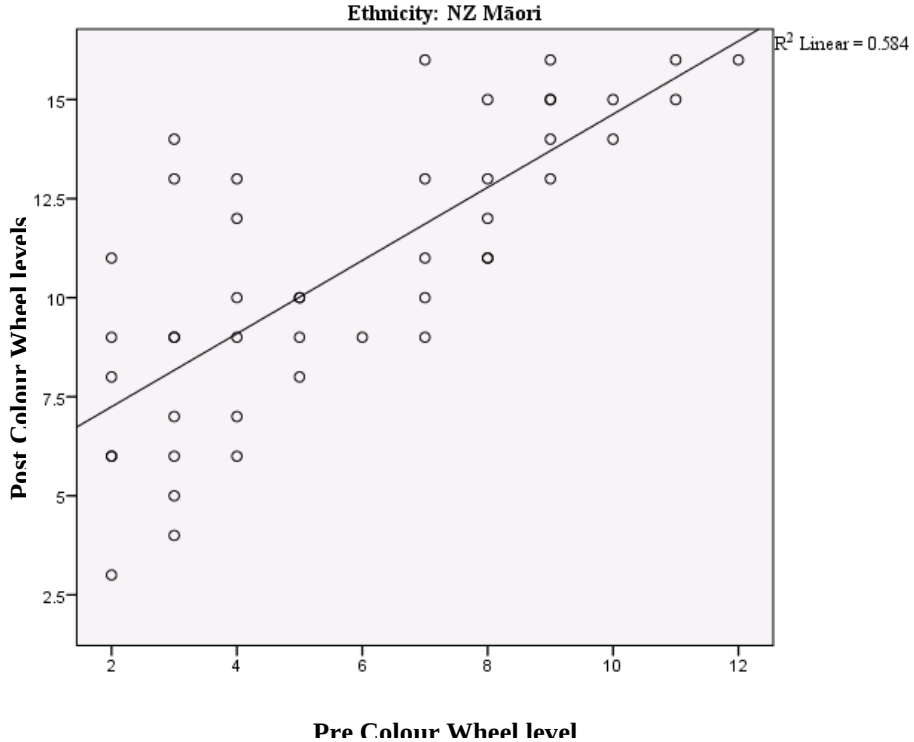
Young-Loveridge, J. (2010). A decade of students' ability in strategy and knowledge. In *Findings from the New Zealand Numeracy Development Project (2009)* (pp. 51–35). Wellington, New Zealand: Learning Media.

7. Appendix A

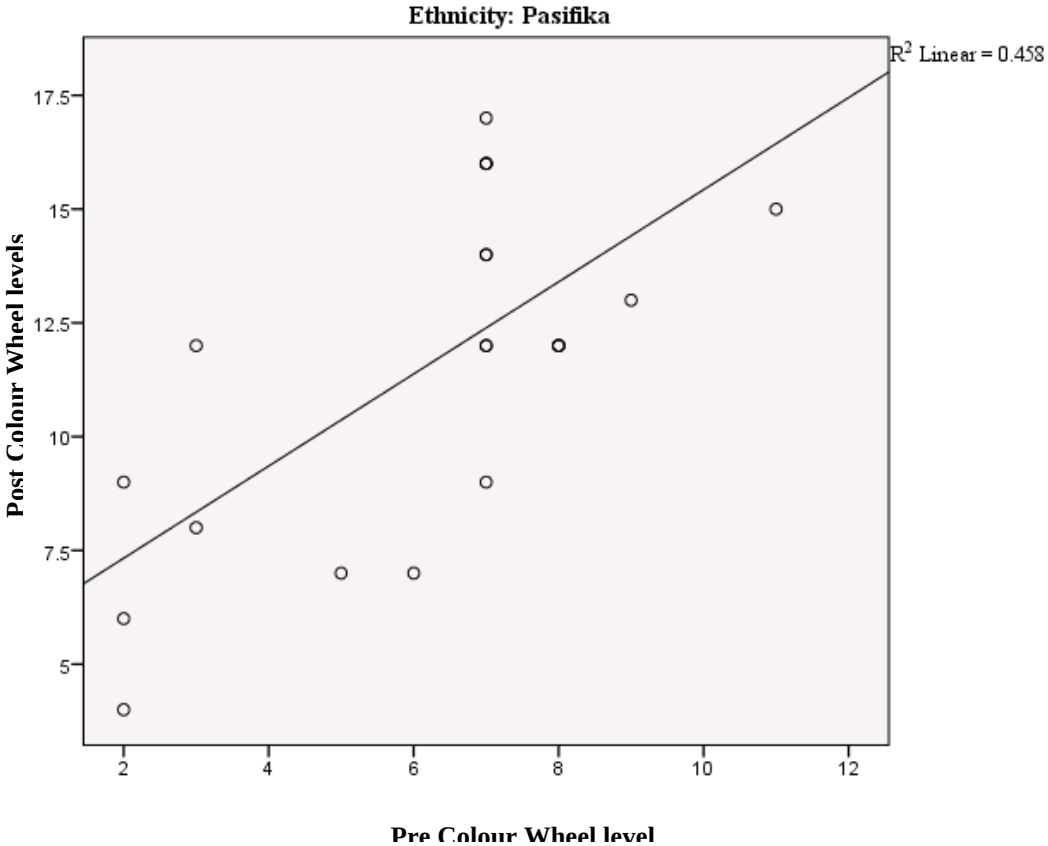
Appendix A Figure 1: Pre- and post-intervention Text Reading for New Zealand European students



Appendix A Figure 2: Pre- and post-intervention Text Reading Levels for New Zealand Māori students



Appendix A Figure 3: Pre- and post-intervention Text Reading Levels for Pasifika students



Appendix A Table 1: Pre-intervention *Concepts about Print*, stanine levels by ethnicity

			Stanine levels								
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Ethnicity	New Zealand European	Count	1	4	4	4	10	9	3	3	38
		per cent	2.6	10.5	10.5	10.5	26.3	23.7	7.9	7.9	100.0
	New Zealand Māori	Count	12	7	8	3	9	3	3	1	46
		per cent	26.1	15.2	17.4	6.5	19.6	6.5	6.5	2.2	100.0
	Pasifika	Count	4	6	3	2	3	0	2	0	20
		per cent	20.0	30.0	15.0	10.0	15.0	0.0	10.0	0.0	100.0
Total		Count	17	17	15	9	22	12	8	4	104
		per cent	16.3	16.3	14.4	8.7	21.2	11.5	7.7	3.8	100.0

Appendix A Table 2: Post intervention *Concepts about Print*, stanine levels by ethnicity

			Stanine Levels									
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Ethnicity	New Zealand European	Count	1	0	2	2	8	2	13	7	3	38
		per cent	2.6	0.0	5.3	5.3	21.1	5.3	34.2	18.4	7.9	100.0
	New Zealand Māori	Count	0	1	8	7	15	4	6	5	0	46
		per cent	0.0	2.2	17.4	15.2	32.6	8.7	13.0	10.9	0.0	100.0
	Pasifika	Count	0	5	0	5	4	1	4	0	1	20
		per cent	0.0	25.0	0.0	25.0	20.0	5.0	20.0	0.0	5.0	100.0
Total		Count	1	6	10	14	27	7	23	12	4	104
		per cent	1.0	5.8	9.6	13.5	26.0	6.7	22.1	11.5	3.8	100.0

Appendix A Table 3: Pre-intervention *Writing Vocabulary* stanine levels by ethnicity

			Stanine Levels							Total
			1	2	3	4	5	6	7	
Ethnicity	New Zealand European	Count	0	3	9	10	12	4	0	38
		per cent	0.0	7.9	23.7	26.3	31.6	10.5	0.0	100.0
	New Zealand Māori	Count	2	10	13	11	9	0	1	46
		per cent	4.3	21.7	28.3	23.9	19.6	0.0	2.2	100.0
	Pasifika	Count	0	4	4	4	3	3	2	20
		per cent	0.0	20.0	20.0	20.0	15.0	15.0	10.0	100.0
Total		Count	2	17	26	25	24	7	3	104
		per cent	1.9	16.3	25.0	24.0	23.1	6.7	2.9	100.0

Appendix A Table 4: Post-intervention *Writing Vocabulary* stanine levels by ethnicity

			Stanine Levels								Total
			2	3	4	5	6	7	8	9	
Ethnicity	New Zealand European	Count	1	1	6	12	13	3	1	1	38
		per cent	2.6	2.6	15.8	31.6	34.2	7.9	2.6	2.6	100.0
	New Zealand Māori	Count	3	5	14	17	5	1	0	1	46
		per cent	6.5	10.9	30.4	37.0	10.9	2.2	0.0	2.2	100.0
	Pasifika	Count	1	3	2	5	3	5	0	1	20
		per cent	5.0	15.0	10.0	25.0	15.0	25.0	0.0	5.0	100.0
Total		Count	5	9	22	34	21	9	1	3	104
		per cent	4.8	8.7	21.2	32.7	20.2	8.7	1.0	2.9	100.0

Appendix A Table 5: Pre-intervention *Letter Recognition* stanine levels by ethnicity

			Stanine Levels								
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Ethnicity	New Zealand European	Count	0	2	7	9	4	8	8	0	38
		per cent	0.0	5.3	18.4	23.7	10.5	21.1	21.1	0.0	100.0
	New Zealand Māori	Count	4	8	9	8	7	7	2	1	46
		per cent	8.7	17.4	19.6	17.4	15.2	15.2	4.3	2.2	100.0
	Pasifika	Count	1	1	4	4	3	4	4	0	21
		per cent	4.8	4.8	19.0	19.0	14.3	19.0	19.0	0.0	100.0
Total		Count	5	11	20	21	14	19	14	1	105
		per cent	4.8	10.5	19.0	20.0	13.3	18.1	13.3	1.0	100.0

Appendix A Table 6: Post-intervention *Letter Recognition* stanine levels by ethnicity

			Stanine Levels						
			2	**3**	**4**	**5**	**6**	**7**	**Total**
Ethnicity	New Zealand European	Count	2	3	1	2	17	13	38
		per cent	5.3	7.9	2.6	5.3	44.7	34.2	100.0
	New Zealand Māori	Count	2	9	7	5	18	5	46
		per cent	4.3	19.6	15.2	10.9	39.1	10.9	100.0
	Pasifika	Count	2	0	2	5	7	5	21
		per cent	9.5	0.0	9.5	23.8	33.3	23.8	100.0
Total		Count	6	12	10	12	42	23	105
		per cent	5.7	11.4	9.5	11.4	40.0	21.9	100.0

Appendix A Table 7: Pre-intervention *Word Recognition* stanine levels by ethnicity

			Stanine levels							
			1	**2**	**3**	**4**	**5**	**6**	**8**	**Total**
Ethnicity	New Zealand European	Count	1	3	7	8	13	6	0	38
		per cent	2.6	7.9	18.4	21.1	34.2	15.8	0.0	100.0
	New Zealand Māori	Count	2	9	17	11	5	2	0	46
		per cent	4.3	19.6	37.0	23.9	10.9	4.3	0.0	100.0
	Pasifika	Count	0	3	2	6	4	3	2	20
		per cent	0.0	15.0	10.0	30.0	20.0	15.0	10.0	100.0
Total		Count	3	15	26	25	22	11	2	104
		per cent	2.9	14.4	25.0	24.0	21.2	10.6	1.9	100.0

Appendix A Table 8: Post-intervention *Word Recognition* stanine levels by ethnicity

			Stanine Levels								
			2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
Ethnicity	New Zealand European	Count	2	1	3	10	16	4	1	1	38
		per cent	5.3	2.6	7.9	26.3	42.1	10.5	2.6	2.6	100.0
	New Zealand Māori	Count	1	3	16	15	8	1	1	1	46
		per cent	2.2	6.5	34.8	32.6	17.4	2.2	2.2	2.2	100.0
	Pasifika	Count	2	2	1	4	8	1	2	0	20
		per cent	10.0	10.0	5.0	20.0	40.0	5.0	10.0	0.0	100.0
Total		Count	5	6	20	29	32	6	4	2	104
		per cent	4.8	5.8	19.2	27.9	30.8	5.8	3.8	1.9	100.0

Appendix A Table 9: Pre-intervention *Hearing and Writing Sounds* stanine levels by ethnicity

			Stanine Levels						Total
			1	2	3	4	5	6	
Ethnicity	New Zealand European	Count	0	1	10	11	6	6	34
		per cent	0.0	2.9	29.4	32.4	17.6	17.6	100.0
	New Zealand Māori	Count	4	9	13	11	4	5	46
		per cent	8.7	19.6	28.3	23.9	8.7	10.9	100.0
	Pasifika	Count	0	2	7	2	2	3	16
		per cent	0.0	12.5	43.8	12.5	12.5	18.8	100.0
Total		Count	4	12	30	24	12	14	96
		per cent	4.2	12.5	31.3	25.0	12.5	14.6	100.0

Appendix A Table 10: Post-intervention *Hearing and Writing Sounds* stanine levels by ethnicity

			Stanine Levels							Total
			2	3	4	5	6	7	8	
Ethnicity	New Zealand European	Count	1	2	3	10	9	7	2	34
		per cent	2.9	5.9	8.8	29.4	26.5	20.6	5.9	100.0
	New Zealand Māori	Count	3	4	17	8	10	3	1	46
		per cent	6.5	8.7	37.0	17.4	21.7	6.5	2.2	100.0
	Pasifika	Count	0	2	5	3	1	5	0	16
		per cent	0.0	12.5	31.3	18.8	6.3	31.3	0.0	100.0
Total		Count	4	8	25	21	20	15	3	96
		per cent	4.2	8.3	26.0	21.9	20.8	15.6	3.1	100.0

Appendix A Table 11: Pre-intervention Overall Teacher Judgements (OTJ) levels by ethnicity

			OTJ Levels			Total
			Well below	Below	At	
Ethnicity	New Zealand European	Count	12	15	2	29
		per cent	41.4	51.7	6.9	100.0
	New Zealand Māori	Count	29	14	0	43
		per cent	67.4	32.6	0.0	100.0
	Pasifika	Count	9	7	0	16
		per cent	56.3	43.8	0.0	100.0
Total		Count	50	36	2	88
		per cent	56.8	40.9	2.3	100.0

Appendix A Table 12: Post-intervention OTJ of reading levels by ethnicity

			OTJ Levels				Total
			Well below	Below	At	Above	
Ethnicity	New Zealand European	Count	1	19	8	1	29
		per cent	3.4	65.5	27.6	3.4	100.0
	New Zealand Māori	Count	6	29	7	1	43
		per cent	14.0	67.4	16.3	2.3	100.0
	Pasifika	Count	5	3	7	1	16
		per cent	31.3	18.8	43.8	6.3	100.0
Total		Count	12	51	22	3	88
		per cent	13.6	58.0	25.0	3.4	100.0

Appendix A Table 13: Pre- and post-intervention Colour Wheel colour levels

Year Levels			Post colour-wheel colour								Total
			magenta	**red**	**yellow**	**blue**	**green**	**orange**	**turquoise**	**purple**	
1	Pre colour wheel colour	magenta	1	5	6	1	0	0	0		13
		red	0	2	6	9	3	0	0		20
		yellow	0	0	0	1	2	1	2		6
		blue	0	0	0	0	1	0	0		1
	Total		1	7	12	11	6	1	2	0	40
2	Pre colour wheel colour	magenta			0	2	0	0		0	2
		red			4	3	4	0		0	11
		yellow			1	6	14	4		0	25
		blue			0	1	6	10		0	17
		green			0	0	0	3		0	3
		turquoise			0	0	0	0		1	1
	Total				5	12	24	17		1	59

8. Appendix B

Appendix B Table 1: Pre-intervention asTTle stages by Year and ethnicity

Year levels				asTTle stages											Total
				1B	1P	1A	2B	2P	2A	3B	3P	3A	4B	4A	
4	Ethnicity	New Zealand European	Count	0	2	2	1	0							5
			per cent	0.0	40.0	40.0	20.0	0.0							100.0
		New Zealand Māori	Count	4	7	3	4	1							19
			per cent	21.1	36.8	15.8	21.1	5.3							100.0
		Pasifika	Count	2	2	0	3	0							7
			per cent	28.6	28.6	0.0	42.9	0.0							100.0
	Total		Count	6	11	5	8	1							31
			per cent	19.4	35.5	16.1	25.8	3.2							100.0
5	Ethnicity	New Zealand European	Count	0	0	4	16	2	2	2					26
			per cent	0.0	0.0	15.4	61.5	7.7	7.7	7.7					100.0
		New Zealand Māori	Count	0	2	6	7	4	1	0					20
			per cent	0.0	10.0	30.0	35.0	20.0	5.0	0.0					100.0
		Pasifika	Count	1	0	3	8	0	1	0					13
			per cent	7.7	0.0	23.1	61.5	0.0	7.7	0.0					100.0
	Total		Count	1	2	13	31	6	4	2					59
			per cent	1.7	3.4	22.0	52.5	10.2	6.8	3.4					100.0
6	Ethnicity	New Zealand European	Count			3	5	1	2	1	0				12
			per cent			25.0	41.7	8.3	16.7	8.3	0.0				100.0
		New Zealand Māori	Count			3	3	5	2	1	1				15
			per cent			20.0	20.0	33.3	13.3	6.7	6.7				100.0
		Pasifika	Count			5	4	3	1	2	0				15
			per cent			33.3	26.7	20.0	6.7	13.3	0.0				100.0
	Total		Count			11	12	9	5	4	1				42
			per cent			26.2	28.6	21.4	11.9	9.5	2.4				100.0
7	Ethnicity	New Zealand European	Count				9	6	7	6	3	2			33
			per cent				27.3	18.2	21.2	18.2	9.1	6.1			100.0
		New Zealand Māori	Count				1	5	4	1	3	0			14
			per cent				7.1	35.7	28.6	7.1	21.4	0.0			100.0
	Total		Count				10	11	11	7	6	2			47
			per cent				21.3	23.4	23.4	14.9	12.8	4.3			100.0

8	Ethnicity	New Zealand European	Count			0	1	1	4	5	3	1	2	1	18
			per cent			0.0	5.6	5.6	22.2	27.8	16.7	5.6	11.1	5.6	100.0
		New Zealand Māori	Count			1	4	1	2	2	0	0	1	0	11
			per cent			9.1	36.4	9.1	18.2	18.2	0.0	0.0	9.1	0.0	100.0
		Pasifika	Count			0	0	2	3	0	0	1	0	0	6
			per cent			0.0	0.0	33.3	50.0	0.0	0.0	16.7	.0	.0	100.0
	Total		Count			1	5	4	9	7	3	2	3	1	35
			per cent			2.9	14.3	11.4	25.7	20.0	8.6	5.7	8.6	2.9	100.0

Note: Shading shows expected levels

Appendix B Table 2: Post-intervention asTTle stages by Year and ethnicity

Year levels				asTTle stages												Total
				1B	1P	1A	2B	2P	2A	3B	3P	3A	4B	4P	5B	
4	Ethnicity	New Zealand European	Count	0	0	2	1	1	0							4
			per cent	0.0	0.0	50.0	25.0	25.0	0.0							100.0
		New Zealand Māori	Count	2	3	2	4	6	0							17
			per cent	11.8	17.6	11.8	23.5	35.3	0.0							100.0
		Pasifika	Count	2	0	0	0	4	1							7
			per cent	28.6	0.0	0.0	0.0	57.1	14.3							100.0
	Total		Count	4	3	4	5	11	1							28
			per cent	14.3	10.7	14.3	17.9	39.3	3.6							100.0
5	Ethnicity	New Zealand European	Count	0	0	1	11	2	6	4	2					26
			per cent	0.0	0.0	3.8	42.3	7.7	23.1	15.4	7.7					100.0
		New Zealand Māori	Count	0	1	2	0	8	4	3	1					19
			per cent	0.0	5.3	10.5	0.0	42.1	21.1	15.8	5.3					100.0
		Pasifika	Count	1	0	0	1	7	1	3	0					13
			per cent	7.7	0.0	0.0	7.7	53.8	7.7	23.1	0.0					100.0
	Total		Count	1	1	3	12	17	11	10	3					58
			per cent	1.7	1.7	5.2	20.7	29.3	19.0	17.2	5.2					100.0
6	Ethnicity	New Zealand European	Count				2	3	3	1	3	0	0	0		12
			per cent				16.7	25.0	25.0	8.3	25.0	0.0	0.0	0.0		100.0
		New Zealand Māori	Count				3	3	2	4	2	1	0	0		15
			per cent				20.0	20.0	13.3	26.7	13.3	6.7	0.0	0.0		100.0
		Pasifika	Count				1	1	3	2	3	2	2	1		15
			per cent				6.7	6.7	20.0	13.3	20.0	13.3	13.3	6.7		100.0
	Total		Count				6	7	8	7	8	3	2	1		42
			per cent				14.3	16.7	19.0	16.7	19.0	7.1	4.8	2.4		100.0
7	Ethnicity	New Zealand European	Count				0	1	3	8	14	3	4			33
			per cent				0.0	3.0	9.1	24.2	42.4	9.1	12.1			100.0
		New Zealand Māori	Count				1	0	3	3	7	0	0			14
			per cent				7.1	0.0	21.4	21.4	50.0	0.0	0.0			100.0
	Total		Count				1	1	6	11	21	3	4			47

		per cent				2.1	2.1	12.8	23.4	44.7	6.4	8.5			100.0

8	Ethnicity	New Zealand European	Count					1	0	3	4	5	2	2	1	18
			per cent					5.6	0.0	16.7	22.2	27.8	1.1	11.1	5.6	100.0
		New Zealand Māori	Count					4	0	2	2	1	1	1	0	11
			per cent					36.4	0.0	18.2	18.2	9.1	9.1	9.1	0.0	100.0
		Pasifika	Count					0	1	3	1	1	0	0	0	6
			per cent					0.0	16.7	50.0	16.7	16.7	0.0	0.0	0.0	100.0
	Total		Count					5	1	8	7	7	3	3	1	35
			per cent					14.3	2.9	22.9	20.0	20.0	8.6	8.6	2.9	100.0

Note: Shading shows expected levels

Appendix B Table 3: Pre-intervention OTJ writing levels by Year levels and ethnicity

Year levels				OTJ Levels				Total
				Well below	Below	At	Above	
4	Ethnicity	New Zealand European	Count	1	8			9
			per cent	11.1	88.9			100.0
		New Zealand Māori	Count	12	12			24
			per cent	50.0	50.0			100.0
		Pasifika	Count	0	8			8
			per cent	0.0	100.0			100.0
	Total		Count	13	28			41
			per cent	31.7	68.3			100.0
5	Ethnicity	New Zealand European	Count	11	15			26
			per cent	42.3	57.7			100.0
		New Zealand Māori	Count	13	10			23
			per cent	56.5	43.5			100.0
		Pasifika	Count	9	18			27
			per cent	33.3	66.7			100.0
	Total		Count	33	43			76
			per cent	43.4	56.6			100.0
6	Ethnicity	New Zealand European	Count	7	9	0	0	16
			per cent	43.8	56.3	0.0	0.0	100.0
		New Zealand Māori	Count	7	5	0	0	12
			per cent	58.3	41.7	0.0	0.0	100.0
		Pasifika	Count	5	5	5	1	16
			per cent	31.3	31.3	31.3	6.3	100.0
	Total		Count	19	19	5	1	44
			per cent	43.2	43.2	11.4	2.3	100.0
7	Ethnicity	New Zealand European	Count	15	11			26
			per cent	57.7	42.3			100.0
		New Zealand Māori	Count	7	1			8
			per cent	87.5	12.5			100.0
		Pasifika	Count	1	0			1
			per cent	100.0	0.0			100.0
	Total		Count	23	12			35
			per cent	65.7	34.3			100.0
8	Ethnicity	New Zealand European	Count	13	13			26
			per cent	50.0	50.0			100.0

		New Zealand Māori	Count	10	2			12
			per cent	83.3	16.7			100.0
		Pasifika	Count	5	1			6
			per cent	83.3	16.7			100.0
	Total		Count	28	16			44
			per cent	63.6	36.4			100.0

Appendix B Table 4: Post-intervention writing OTJ levels by Year levels and ethnicity

Year levels				OTJ Levels				Total
				Well below	Below	At	Above	
4	Ethnicity	New Zealand European	Count	0	3	5	0	8
			per cent	0.0	37.5	62.5	0.0	100.0
		New Zealand Māori	Count	4	12	7	0	23
			per cent	17.4	52.2	30.4	0.0	100.0
		Pasifika	Count	2	1	4	1	8
			per cent	25.0	12.5	50.0	12.5	100.0
	Total		Count	6	16	16	1	39
			per cent	15.4	41.0	41.0	2.6	100.0
5	Ethnicity	New Zealand European	Count	4	15	8		27
			per cent	14.8	55.6	29.6		100.0
		New Zealand Māori	Count	3	13	7		23
			per cent	13.0	56.5	30.4		100.0
		Pasifika	Count	3	19	5		27
			per cent	11.1	70.4	18.5		100.0
	Total		Count	10	47	20		77
			per cent	13.0	61.0	26.0		100.0
6	Ethnicity	New Zealand European	Count	3	7	7	0	17
			per cent	17.6	41.2	41.2	0.0	100.0
		New Zealand Māori	Count	2	6	6	0	14
			per cent	14.3	42.9	42.9	0.0	100.0
		Pasifika	Count	3	3	7	3	16
			per cent	18.8	18.8	43.8	18.8	100.0
	Total		Count	8	16	20	3	47
			per cent	17.0	34.0	42.6	6.4	100.0
7	Ethnicity	New Zealand European	Count	4	19	4		27
			per cent	14.8	70.4	14.8		100.0
		New Zealand Māori	Count	2	5	1		8
			per cent	25.0	62.5	12.5		100.0
		Pasifika	Count	0	1	0		1
			per cent	0.0	100.0	0.0		100.0
	Total		Count	6	25	5		36
			per cent	16.7	69.4	13.9		100.0
8	Ethnicity	New Zealand European	Count	8	13	6		27
			per cent	29.6	48.1	22.2		100.0

		New Zealand Māori	Count	7	4	1		12
			per cent	58.3	33.3	8.3		100.0
		Pasifika	Count	1	4	1		6
			per cent	16.7	66.7	16.7		100.0
	Total		Count	16	21	8		45
			per cent	35.6	46.7	17.8		100.0

9. Appendix C

Definitions of accelerated learning on each literacy measure are:

1. Reading: In 10 weeks accelerated learning was shown by:

   Observation Survey: a student improved by at least two stanines; the increase in group means for the survey measure was statistically significant from pre to post programme.

   Instructional text level: Year 1 and 2 students improved by more than the expected colour wheel levels or sublevels benchmarked to the Ready to Read series.

   Overall Teacher Judgement: In the 10 weeks, a student improved by one band of teacher judgement from well below, below, at, or above.

2. Writing: in 10 weeks a student improved by at least two stanine levels on the asTTLe test.

   Overall teacher judgement: in the 10 weeks a student improved by at least one band of teacher judgement from well below, below, at, above.