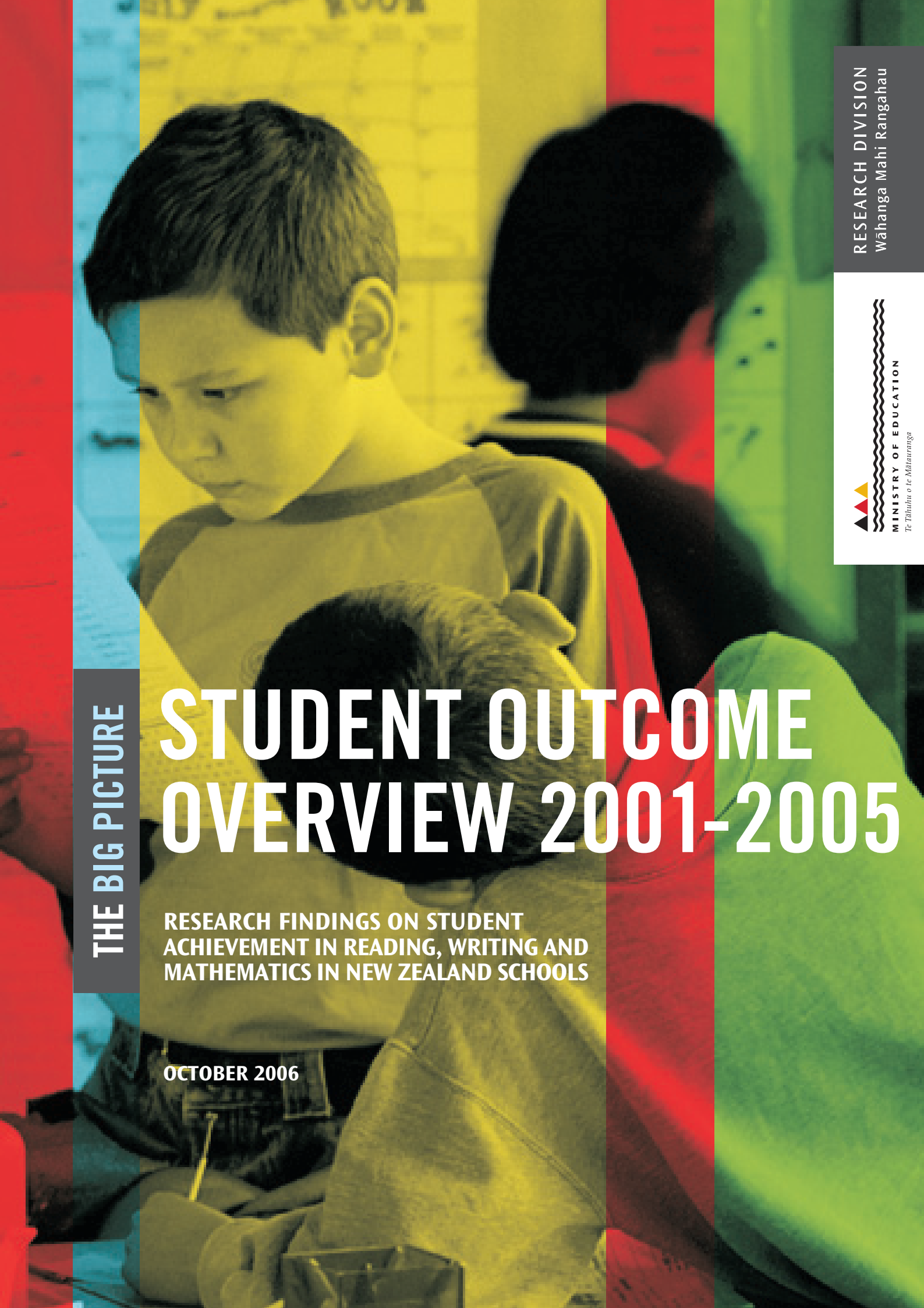

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THE BIG PICTURE

STUDENT OUTCOME OVERVIEW 2001-2005

RESEARCH FINDINGS ON STUDENT ACHIEVEMENT IN READING, WRITING AND MATHEMATICS IN NEW ZEALAND SCHOOLS

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CONTENTS

INTRODUCTION

Purpose of the Student Outcome Overview

This *Student Outcome Overview* presents findings from a wide range of studies of student achievement across the years of schooling, covering different topics of study and different types of assessment. It expands the section of the *Schooling Strategy* on overall student achievement[1] that provides a national and international context for the goal of all students achieving their full potential. The *Student Outcome Overview* aims to illuminate relationships between findings from several studies to provide a rich, though still broad, picture of student achievement. The study findings also help with developing a sense of the relative priorities across areas of interest. They provide both a New Zealand and an international perspective. The *Overview* also provides some initial research, policy, programme and operational responses by the Ministry of Education to the findings. The Ministry will develop more detailed proposals over the coming year, as well as continue with a range of programmes and initiatives in the broad area of student achievement.

Studies included in the Overview

The studies and data collections included in the *Overview* have different focuses of interest, objectives, methodologies and types of assessment, and were done at different times and have different student populations. However, together they provide a broadly consistent picture of achievement and areas of concern. In a few areas the results of different studies seem to be telling different stories. The *Overview* also mentions results of other research and evaluations which help clarify complex relationships. A particular example is recent findings from the Literacy Professional Development Project[2].

Assessment Tools for Teaching and Learning (asTTle)

asTTle is an educational resource for assessing reading, writing and mathematics developed for the Ministry of Education by the University of Auckland. asTTle provides teachers, students and parents with information about a student's level of achievement relative to desired curriculum achievement outcomes, for students in Years 4 to 12. asTTle scores are linked to curriculum levels in each of the assessment areas. The primary and ongoing purpose of asTTle is to provide a tool for teachers to create tests to assess individual students' learning needs – a formative assessment purpose.

In addition, the development stage of asTTle generated, as a one-off by-product of the trialling of test items in the period from November 2000 to March 2004, nationally representative statistics on student achievement. The asTTle findings presented in the *Overview* are aggregated from data collected across this time period. They are not based on any data generated by schools as part of their ongoing use of asTTle as an assessment tool.

Data collected in the development phase of asTTle has provided new information[3] on student achievement, at both primary and secondary levels, in the domains of reading, writing and mathematics. These three asTTle domains form the backbone of the *Overview*.

National Education Monitoring Project (NEMP)

NEMP is a solely New Zealand assessment study of Year 4 and Year 8 students, undertaken by the Education Assessment and Research Unit (EARU) of the University of Otago under contract to the Ministry of Education. NEMP measures achievement across all curriculum areas including reading, writing and mathematics. Monitoring started in 1995 and runs every year in a four-year cycle across curriculum areas. Key differences between NEMP and asTTle are:

- NEMP's goal is to provide *detailed* national information about what a sample of children can do, across all curriculum domains, so that patterns and trends in performance can be recognised. In contrast, the development phase of asTTle entailed testing a large, nationally representative sample of students, linking the test items to curriculum levels, and deriving overall achievement scores. asTTle's ongoing primary aim was to produce an assessment tool for individual teacher use.

1 Ministry of Education (2005g), p 7

2 Learning Media (2006)

3 Project asTTle Team (2006a–d)

- NEMP items are not linked to specific curriculum levels whereas asTTle items are.
- NEMP reports a percentage correct at each year for each task. But the results from the asTTle development phase provide scores for curriculum objectives and areas that are weighted by the difficulty of each item regardless of the year of students being tested.

Trends in International Mathematics and Science Study (TIMSS)

TIMSS 02/03 was the third in a cycle of studies designed to measure trends in mathematics and science achievement, at the middle primary and lower secondary levels, across a large number of countries. The International Association for the Evaluation of Educational Achievement (IEA) sponsors TIMSS. The study was carried out in New Zealand in late 2002 and international comparative results were published in December 2004. Approximately 4,300 Year 5 and 3,800 Year 9 students participated. A report on the New Zealand key student achievement findings of TIMSS 02/03 was published in April 2006.

Progress in International Reading Literacy Study (PIRLS)

PIRLS is a study of Year 5 students where the most recent results are from the 2001 cycle. The 2005/06 cycle is in progress. The IEA sponsors PIRLS. PIRLS assessment focuses on three aspects of students' reading literacy:

- processes of reading comprehension
- purposes for reading
- reading behaviours and attitudes.

The Trends in Reading Literacy Study was undertaken in conjunction with PIRLS 2001. This was a partial replication of the IEA's 1990–1991 study of reading literacy. The Trends Study measured similarities and differences in achievement of Year 5 students in reading literacy in 2001 with their counterparts in 1990.

Programme for International Student Assessment (PISA)

PISA is an OECD-sponsored study of 15-year-old students which assesses achievement in reading literacy, mathematical literacy and scientific literacy. The main focus of the assessment changes with each cycle. The major domain of the 2000 cycle was reading literacy, with mathematics and scientific literacy as minor domains. In 2003, the major PISA domain was mathematics, with reading and science as minor domains. PISA assessment focuses on applying knowledge and experience to real world issues, rather than being limited to mastery of specific school curricula.

National Certificate of Educational Achievement (NCEA)

NCEA is New Zealand's national qualification for senior secondary students, implemented from 2002. It covers the comprehensive range of subjects taught in New Zealand secondary schools. NCEA is one of the qualifications of the National Qualifications Framework (NQF). This report uses NQF statistics to provide information on student achievement at the senior secondary school level, which it refers to as NCEA results.

More detailed information on the studies included in the *Overview* appears in Appendix 1.

Structure and scope of the Overview

We have decided to structure the *Overview* within the framework of the three asTTle domains to keep the report a manageable size, though several studies include assessment in other domains. The chapters of the *Overview* vary in size because some domains are more commonly assessed across the various studies than other domains.

asTTle assesses student achievement in both English and Māori medium, and the development phase of asTTle provided information on student achievement in pānui (reading), tuhituhi (writing) and pāngarau (mathematics) within the framework of the Māori medium curriculum. However, the *Overview* covers findings on student achievement in English medium only, with a separate report on Māori medium.

None of the studies establish *causal* links between interventions (or student, family, teacher or school attributes) and achievement, nor did they aim to. Rather, they provide *associations* or *correlations*. We therefore need to carefully consider and analyse the results of these studies, together with other knowledge and research findings about teaching and learning, in order to build a comprehensive evidence base for developing the most effective interventions.

The *Overview* is a first step in integrating findings across different national assessment studies, and aims to provide a broadly descriptive picture, rather than undertake detailed analysis. However, further work would be more in-depth and use more technically sophisticated methods to compare findings across studies.

Summary of key findings

The following points summarise the key findings of the *Overview*. More detail appears in Chapter 5.

- Students advance in learning as they pass through their years of schooling. However, learning does not progress at a constant rate across curriculum levels or across school years.
- New Zealand students achieve in reading and mathematics, on average, at a high level compared to other countries.
- The highest achieving students in New Zealand are comparable to the best in the world.
- New Zealand students have a wide spread of achievement in reading compared to other highly achieving countries. Also, the spread of achievement is wide within individual schools.
- Writing is an area where New Zealand students could do better, though recent findings from schools participating in the national Literacy Professional Development Project show significant improvements in writing are occurring.
- Though some boys achieve at a very high level, boys are over-represented in those who achieve poorly, particularly in writing and also in reading.
- Although some Māori and Pasifika students achieve at a very high level, Māori and Pasifika students achieve, on average, less well than their Pākehā and Asian peers.

ACHIEVEMENT IN READING

Aspects of reading

The studies or data sources which assess student reading achievement are: NEMP (Years 4 and 8), asTTle (Years 4-12), PIRLS (Year 5), PISA (15-year-olds) and NCEA (Years 11, 12 and 13).

Different studies have a range of concepts and definitions of the components of reading.

NEMP's central organising theme for reading is constructing meaning from a range of texts for a variety of purposes including:

- reading for enjoyment
- reading to follow instructions
- reading to search for information
- reading to assimilate knowledge
- reading to analyse critically.

asTTle assesses reading comprehension in six curriculum content areas:

- finding information
- knowing the meaning of words and language devices
- understanding the main ideas and details of text
- making connections between and within texts
- drawing inferences, evaluations and interpretations from a text
- understanding the meanings generated by grammar, punctuation and spelling.

PIRLS distinguishes two reading purposes: *reading for literary experience* and *reading to acquire and use information*. For each of these purposes, four reading processes are tested:

- focusing on and retrieving explicitly stated information
- making straightforward inferences
- interpreting and integrating ideas and information
- examining and evaluating content, language and textual elements.

PISA defines reading literacy broadly as the "understanding, using and reflecting on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate effectively in society"[4]. PISA measures achievement in the following areas: *retrieving information, interpreting texts*, and *reflection and evaluation*.

NCEA has a wide range of achievement standards that cover aspects of reading. They are included in the NCEA learning area *Language and languages – English*. This chapter includes some summary results for NCEA achievement standards on reading and understanding unfamiliar texts. The assessments for these NCEA standards are approximately similar to assessments in the studies. The chapter also mentions results for the overall measure of the literacy requirements for level 1 NCEA, which combines reading and writing as well as oral and visual communication but gives a broad picture of student achievement.

Comparisons between NCEA results and study findings should be treated cautiously because NCEA results relate to the populations of students who enter for particular standards, whereas the studies have representative samples of all students. Also, NCEA assessments lead to formal qualifications, so the purpose of assessment differs from that of research studies.

4 Ministry of Education (2004d), p 9

Overall reading achievement

Overall, the studies of New Zealand student achievement provide a picture of high and stable average reading skills in recent years, with skills increasing across school years.

New Zealand students perform well, on average, in reading. PIRLS shows that Year 5 students in 2001 achieved significantly above the international average. PISA, in findings consistent with PIRLS, showed that 15-year-old New Zealand students are in the group of second-ranked countries, significantly above the international mean[5]. NCEA results for 2004 showed that 78 percent of all Year 11 candidates met the literacy requirements (which combine achievement in both reading and writing achievement standards) of NCEA Level 1.

We have a high proportion of students who do very well indeed in reading. PISA 2000 results showed that more than 19 percent of New Zealand students performed at the top level of proficiency in reading, compared with the OECD average of ten percent.

However, both PIRLS and PISA showed that the spread of reading achievement is wider than in most other highly achieving countries. PISA results showed that while New Zealand had a high proportion of students achieving at the highest level, we also had a relatively high proportion who achieve at the bottom benchmark or below. NEMP and asTTle also provided evidence of a wide spread of achievement.

Average reading achievement has been generally stable over recent years. NEMP results for Year 4 students showed substantial improvement in reading comprehension between 1996 and 2000, and the gains were maintained between 2000 and 2004. For Year 8 students, however, NEMP results showed no discernable change in performance in reading comprehension between 1996 and 2004.

PISA showed that the performance of New Zealand 15-year-olds (mostly Year 10) in reading literacy did not change significantly between 2000 and 2003. Furthermore, the Trends in Reading Literacy Study showed that Year 5 students' overall performance in literacy was virtually the same as 10 years earlier when compared with the 1990–1991 IEA Reading Literacy Study[6].

Reading achievement by student year

Students' achievement in reading progresses through their years of schooling as demonstrated by both NEMP and asTTle.

NEMP results showed that Year 8 students demonstrated a consistently higher level of performance in reading comprehension than Year 4 students. asTTle results were consistent and showed in addition, that from Year 9, and then throughout the secondary school levels, the annual gain was substantially stronger compared to the primary years. The average reading performance increased to curriculum Level 5 by Years 11/12.

Reading achievement by gender

All the assessment studies show that, on average, girls achieve at a higher level in reading than boys. But the evidence is mixed and several studies show that the gap between girls' and boys' reading achievement narrows as they progress through their schooling years.

- At *Year 4*, NEMP 2004 showed a 'moderate' difference in achievement in reading tasks in favour of girls.
- For *Year 5* students, PIRLS and asTTle showed a statistically significant advantage to girls compared to boys in reading performance. Indeed, PIRLS showed that this was one of the largest gender differences in reading achievement in the world.
- At *Year 8*, NEMP and asTTle showed that this gap narrowed to a 'small' difference.
- At *Year 10*, the difference was minimal according to asTTle, but PISA reported a significant and persistent disparity in reading in favour of 15-year-old girls, though it was smaller than the international average gender difference.
- *Year 11* NCEA results[7] for 2004 showed girls outperforming boys in reading. For example, results for the Level 1 achievement standard *Read and show understanding of unfamiliar texts* showed that 59 percent of results for girls were 'achieved' (including with merit or excellence), compared with 49 percent of boys' results. In addition, 84 percent of girls met the literacy requirements of Level 1 NCEA compared with 73 percent of boys.

5 Ministry of Education (2004d), p 10

6 Ministry of Education (2003c), p 7

7 NCEA and asTTle findings relate to different populations of students; asTTle data is based on a representative sample of all students at each school year, whereas NCEA results relate to candidates who have gained at least one NQF credit in a given year. Also, some Year 12 students choose not to do English at all, so the population of Years 11/12 students studying English differs from the population of students in earlier years who study English even within the same data collection. NCEA assessments lead to formal qualifications whereas asTTle assessments have relatively low stakes for the student. Differences in findings should, therefore, be treated cautiously.

Boys have a wider spread of achievement in reading than girls and are a much larger proportion of the students at the lowest levels of proficiency in reading. According to PISA 2000, 18 percent of 15-year-old boys performed at the bottom benchmark or below, compared with only eight percent of girls.

For Year 5 students, this difference in favour of girls continued without significant change through the 1990s, as shown when the results of the 1990-1991 Reading Literacy Study are compared with the 2001 Trends in Reading Literacy Study. But then, according to NEMP, the gap between Year 4 girls' and boys' achievement narrowed between 2000 and 2004.

Recent results from evaluations of the national Literacy Professional Development Project indicate that literacy initiatives improve boys' reading achievement, on average, more than girls'[8], which provides an expectation that the gap can narrow.

Given how variable these findings are across school years and between different types of studies, any future research on gender differences in reading achievement could add further insight.

Research and policy work on improving the reading achievement of underachieving boys is a relatively new focus for the Ministry of Education. Important research questions are:

- What groups of boys are underachieving?
- What are the characteristics, relevant to reading, of these groups of boys?
- What interventions to improve reading work well for boys?

Reading achievement by ethnicity

Results from a range of studies show that many Māori, Pākehā, Pasifika and Asian students, as well as students from other ethnic groups[9], achieve at a high level in reading. Results also show that, on average, Pākehā and Asian students perform better than their Māori and Pasifika peers across all schooling years. asTTle also showed that all students, regardless of ethnicity, experienced stronger gains in reading skills during their secondary schooling.

- *Year 4* Pākehā students (NEMP 2004), on average, achieved 'moderately' higher than both Māori and Pasifika students.
- The mean scores for *Year 5* (PIRLS) Pākehā and Asian students were significantly higher than the international mean, whereas the mean scores for Māori and Pasifika were significantly lower than the international mean. According to asTTle, Māori and Pasifika students started at Year 5 with lower average scores in reading than Pākehā/New Zealand European and Asian students.
- In *Year 8* Pākehā students (NEMP 2004) also achieved 'moderately' higher than both Māori and Pasifika students.
- In *Years 11/12* (asTTle) the ethnic disparity persisted.

NCEA results confirm that there are ethnic differences in reading achievement at senior secondary school levels. Table 1 shows 2004 figures for the percentages of all Year 11 candidates who met the NCEA Level 1 literacy requirements.

TABLE 1

Percent of Year 11 candidates who met NCEA Level 1 literacy requirements by ethnic group, 2004	
Ethnic group	**Percent**
European	84
Māori	69
Pasifika	62
Asian	74
Other	81
Total	**79**

8 Learning Media (2006), p35

9 Different data collections classify and label ethnic groups differently. For example, NEMP uses 'Pākehā' while NCEA uses 'European'.

Table 2 shows the results in 2004 from the NCEA Level 1 achievement standard *Read and show understanding of unfamiliar texts*. The pattern of ethnic differences was consistent with that of Table 1.

TABLE 2

Percent of results 'achieved' in *Read and show understanding of unfamiliar texts* by ethnic group, 2004	
Ethnic group	**Percent**
European	61
Māori	34
Pasifika	26
Asian	55
Other	60
Total	**54**

The range or spread of achievement in reading was wide for every ethnic group, according to PIRLS 2001, with both high and low achieving students. But the range between the highest and lowest achieving students was greater for Māori and to a lesser extent for Pākehā than for Asian and Pasifika.

According to NEMP, the gap between Māori and Pākehā Year 4 students substantially narrowed between 2000 and 2004 but there was no change for Year 8 students.

Clearly, the assessed reading skills of many Māori and Pasifika students continue to be a concern, though asTTle and the other studies show that there are Māori and Pasifika students who also achieve at a high level, including achieving with merit or excellence in NCEA results.

According to the *Quality Teaching for Diverse Students in Schooling: Best Evidence Synthesis*, creating effective links between school cultural contexts and students' other cultural contexts helps students' learning[10].

The *Māori Education Strategy* identifies literacy as a strategic aspect of raising the quality of mainstream education for Māori. Findings from the schools participating in the Literacy Professional Development Project show that Māori students had a bigger positive shift in reading performance than other students. However, on average Māori students' performance is still below that of Pākehā students.

The Ministry monitors Pasifika student achievement carefully against set targets, and it is working with the Pasifika education sector to develop specific strategies to improve the teaching of reading and improve school/community liaison (including specific Pasifika communities). The targets will focus on both achievement in classrooms and more students completing qualifications. More research is needed relating to English literacy where a home context of other languages exists. English is the language of instruction and assessment for most Pasifika students in New Zealand. Continued research on the bilingual or multilingual background of many Pasifika students would be useful to help identify strategies to improve Pasifika achievement in an English language context.

Further research would be useful which helps disentangle the relationships between student achievement and both socio-economic status and ethnicity.

Reading achievement by whether English is spoken at home

Several studies show that, across all years of schooling, students who speak English at home achieve better at reading (in English) than those who do not.

asTTle showed that, on average, across all years of schooling, students who always or usually spoke English at home, performed better at reading than those who sometimes or never spoke English at home. This gap stayed steady throughout Years 5 to 11/12. NEMP results for 2004 also showed this difference – 'moderate' at Year 4 and 'small' at Year 8. PIRLS confirmed this result for Year 5 students in 2001 – students who always or almost always spoke English at home typically achieved significantly higher in reading attainment. The Trends in Reading Literacy Study showed that, for Year 5 students, this disparity was not significantly different in 2001 compared to 1990-91.

10 Ministry of Education (2003b), p 32

Reading achievement by school decile

Although studies conducted in the period 2000-2004 found some relationship between school decile and reading achievement, very recent findings show that significant improvements can be made through carefully targeted initiatives in low decile schools.

The Ministry of Education has 21 schooling improvement projects, including in North Waikato, Mangere and Otara. They aim to increase student achievement in low decile schools. In the Mangere project, for example, seven decile one schools have worked on raising achievement in reading comprehension, at Years 3-9, through focused professional development and analysis of test data to identify student strengths and weaknesses. In 2005, on average, the Year 3 students reached national norms – a first for a decile one area. Years 4-9 made statistically significant gains in reading achievement for each year they were in the programme. Other school improvement programmes are showing similar results.

The Literacy Professional Development Project, which began in 2004, provides schools with a two-year programme of professional development aiming to improve student learning and achievement while working from an evidence base. A group of 40 schools participated in the project with a reading comprehension focus. The programme has accelerated the pace of achievement for the lowest performing students.

asTTle data, collected 2000-2004, showed that, on average, both primary and secondary students in schools of deciles 2 or below have reading achievement significantly below that of their peers in decile 3 or above schools. Average scores were, in fact, nearly level across the deciles 5 and above.

For PISA 2000, a socio-economic status (SES) variable was created for students based on parental occupation. This showed that a statistically significant gradient of increasing achievement in reading with increasing SES for 15-year-olds, that is the higher the SES, the higher the achievement in reading. Compared to other OECD countries, the gap between the reading achievement of high and low SES students was relatively large. However, not all students from low SES backgrounds performed poorly compared with OECD averages[11].

School decile and student SES are different variables. School decile is an attribute of the areas that students are drawn from, whereas the PISA SES is a more direct attribute of the student. Some low SES students go to high decile schools. More research would be useful on the relationships between school decile and student SES, and which explores in more depth the aspects of student SES that are most strongly related to reading achievement. Also, information on what student, family or school characteristics are most related to the improvements in reading that are owing to literacy initiatives in low decile schools would be valuable.

In an international context, New Zealand schools have relatively little variation in reading achievement between schools, and very high variation within individual schools[12]. This indicates that equity within schools in New Zealand is a bigger issue than equity between different groups of schools.

Achievement in reading content areas

Different studies have different ways of analysing the dimensions of reading. For example, in asTTle, the major content areas of reading all followed the general pattern of rapid growth in achievement from Year 9. However, students scored lower at primary levels on the content area *making connections between and within texts* compared to the other reading content areas and this content area fell slightly behind the other areas again at Year 10.

PIRLS 2001 results showed that Year 5 students' performance in *interpreting, integrating and evaluating processes* was relatively better than in *retrieval and straightforward inferencing processes*.

PISA 2000 results showed even performance across the three scales: *retrieving information, interpreting texts*, and *reflection and evaluation*.

11 Ministry of Education (2002), p 97

12 OECD (2005), pp 24–26

Attitudes to reading

The various studies do not show any clear or consistent relationship between attitudes and reading achievement. This applies across a range of attitudes and beliefs – enjoyment, confidence, interest and perceptions of ability. NEMP and asTTle examined degree of confidence in reading and liking of reading, while PIRLS also examines self-concept, based on self-perceptions of ability.

NEMP and asTTle, using the same questions, found that younger students (Years 4 and 5) generally were positive towards reading, but that as students got older their level of liking of and confidence in reading declined. Boys and girls had similar levels of confidence across the years, but boys liked reading less than girls did. An ethnic analysis of attitudes to reading showed little difference. Also differences across school decile were minimal. The asTTle data showed little difference in achievement levels in reading between students with positive or negative attitudes.

On the other hand, PIRLS results found that girls have a more positive self-concept in reading than do boys. Those students at Year 5 who had a high self-concept in reading achieved higher reading scores than those who had a low self-concept.

Information emerging from the Literacy Professional Development Project suggests that interviews with students about their learning can be a lever for positive change in reading achievement.

A recent study undertaken for the European Commission on student performance using evidence from PISA, TIMSS and PIRLS, finds that self-confidence and lack of anxiety are correlated with higher average achievement in reading. Also, motivation matters for learning outcomes in reading[13]. The study author points out, however, that "interest in and enjoyment of a subject is neither a sufficient nor a necessary precondition for high average achievement scores among students".

Overall, findings about the relationship between attitudes and achievement are variable. We would need clearer evidence before developing any policies that specifically target changing attitudes as a means to increase achievement in reading. However, teaching practice should, of course, continue to include encouraging students to enjoy reading and to build their confidence in reading.

13 Haahr, J. H. (2005), pp 136,137

ACHIEVEMENT IN WRITING

Aspects of writing

The studies or data sources which assess writing achievement are: NEMP (Years 4 and 8), asTTle (Years 4-12) and NCEA (Years 11, 12 and 13). None of the current international studies assess writing as a domain.

In line with the New Zealand Curriculum, asTTle measures student achievement in the two main kinds of writing: poetic (emphasising the artistic qualities of language) and transactional (emphasising the exchange of ideas). Seven curriculum content areas are assessed:

- audience awareness and purpose
- content or ideas
- organisation or structure
- language resources
- grammar
- punctuation
- spelling.

In addition, the following purposes for writing are assessed: to persuade, instruct, narrate, describe, explain, recount, analyse.

A caveat on the analysis below is that asTTle assesses writing through a 40-minute pen-and-paper test. This does not allow students to process, edit, or rework their writing, as would happen in a regular classroom setting.

NEMP's central organising theme for writing is: constructing and communicating meaning in written forms for various purposes (inform, entertain, persuade) and audiences.

NCEA has a wide range of achievement standards that cover aspects of writing. They are included in the NCEA learning area *Language and languages – English*. This chapter presents some summary results for achievement standards on producing formal writing.

Overall writing achievement

asTTle showed that students' writing performance generally increased across their years of schooling. However, the rate of increase was slower than for reading and mathematics. Writing skills were, on average, at a lower curriculum level compared with achievement in reading and mathematics across school years. The writing skills of many secondary students were no better than that of many primary school students.

The spread of students' writing performance was wider than students' reading and mathematics performance. Also, this spread in writing achievement widened in the lower and middle secondary school years, whereas it narrowed by Year 11 in reading and mathematics.

However, recent findings from the national Literacy Professional Development Project show a significant lift in students' writing performance related to changes in teaching practice.

Writing achievement by student year

Students generally progress in writing achievement through their years of schooling, but at a slower rate compared to reading.

According to asTTle, the average increases in achievement in writing were noticeably steeper over Years 8, 9 and 10 compared with earlier and later years. However, average achievement in writing only reached curriculum Level 4 in Years 11/12, compared to an average achievement of curriculum Level 5 in reading and mathematics.

NEMP findings showed progress in achievement between Years 4 and 8, with little change observable between 1998 and 2002.

Writing achievement by gender

Girls' average writing skill levels are significantly higher than boys' throughout all years of schooling, though some boys can write very well.

asTTle shows that the difference between boys' and girls' average achievement was much larger in writing than in reading or in mathematics. During Years 5 to 7, girls were about one year ahead of boys, but the gap widened to be about two years ahead by Year 9, then narrowed, but did not close, at Years 11/12. Boys' writing performance has a wider spread than girls' throughout schooling years.

The 2002 NEMP results confirmed the pattern shown in asTTle with a widening gender gap towards the end of the primary years. Year 4 girls performed better than boys on 39 percent of writing tasks (and the same as boys on 61 percent), but Year 8 girls performed better on 88 percent (and the same as boys on 12 percent).

NCEA results for 2004 confirmed a picture of girls significantly outperforming boys in writing. For example, results for the Level 1 achievement standard *Produce formal writing* showed that 63 percent of results for girls were 'achieved' (including with merit or excellence), compared with 47 percent of boys' results.

Writing achievement by ethnicity

Pākehā[14] and Asian students perform better at writing than their Māori and Pasifika peers.

asTTle results showed that Pākehā/New Zealand European and Asian/Other students had higher – on average, one year ahead – writing scores compared to Māori and Pasifika students. 2002 NEMP results confirm that non-Māori students in both Years 4 and 8 scored higher than their Māori peers. However, for Year 4 students the Māori/non-Māori disparity decreased between 1998 and 2002.

Results in 2004 from the NCEA Level 1 achievement standard *Produce formal writing* showed a consistent pattern of ethnic differences – refer Table 3.

TABLE 3

Percent of results 'achieved' in *Produce formal writing* by ethnic group, 2004

Ethnic group	**Percent**
European	60
Māori	43
Pasifika	36
Asian	52
Other	59
Total	**55**

Current initiatives which aim to address achievement in writing include the Literacy Professional Development Project, which shows positive significant shifts in Māori students' writing performance, though it is still lower than the national average. The *Māori Education Strategy* and the *Pasifika Education Plan* also identify improving writing achievement as a strategic aim.

Writing achievement by whether English is spoken at home

Those students who always or usually spoke English at home had, on average, higher writing scores across all years than those who did not. The difference was small at primary school but increased throughout secondary school to reach more than one year's difference at Years 11/12. This contrasts with asTTle's finding for reading where the gap in achievement stayed steady, and with mathematics where the gap closed at Years 11/12.

Writing achievement by school decile

Although studies conducted in the period 2000-2004 found some relationship between school decile and writing achievement, very recent findings show that significant improvements can be made through carefully targeted initiatives in low decile schools.

The Literacy Professional Development Project, beginning in 2004, included 45 schools that took a writing focus. The whole cohort of students participating in the programme had, on average, a significant positive shift in writing

14 Different data collections classify and label ethnic groups differently. For example, NEMP uses 'Pākehā' while NCEA uses 'European'.

achievement, but importantly, the lowest performing 20 percent of students had a much greater increase in performance[15]. The gains in writing are, on average, greater than in reading.

asTTle results for 2000-2004 showed that, except when comparing the very highest with the very lowest deciles, school decile was not highly correlated with writing achievement. Deciles 2 to 8 in primary, and deciles 3 to 10 in secondary, showed little difference in writing achievement. This finding is similar to asTTle's results for the relationship between school decile and reading and mathematics achievement.

2002 NEMP results showed differences in the writing performance of students from low, medium and high decile schools showing a trend of higher average scores for students from higher decile schools.

Achievement in writing content areas

asTTle results show that the content areas of writing (audience awareness and purpose; content or ideas; organisation or structure; language resources; grammar; punctuation; spelling) all displayed a similar pattern to each other with spelling and grammar generating the highest scores. In punctuation, however, students scored lower than in the other content areas.

Achievement in writing purposes

According to asTTle results, student ability to write for different purposes (persuade, instruct, narrate, describe, explain, recount, analyse) was relatively similar across the primary school years. However, differences developed when students entered secondary school, with students scoring highest on *narrating* and lowest on *recounting*.

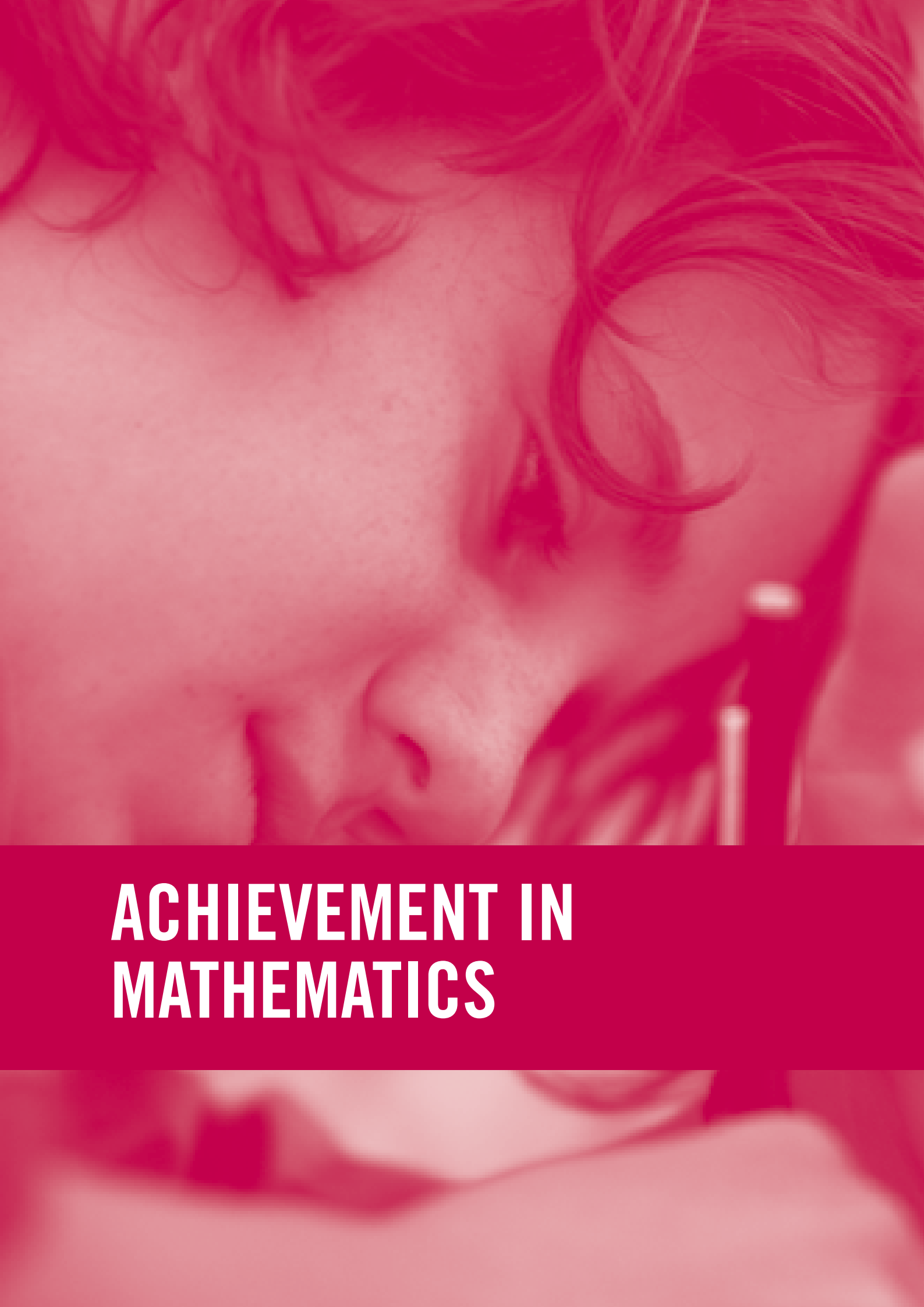
Attitudes to writing

As with reading and mathematics, the various studies do not show any clear or consistent relationship between attitudes and writing achievement.

asTTle showed that students who were most confident and who liked writing the most scored highest. However, this relationship appeared to depend solely on age – older children write better and have more positive attitudes. NEMP showed girls displaying more positive attitudes to writing than boys.

So far, evidence about attitudes to writing (as for reading) indicates little benefit is likely from specifically targeting attitudes as a means for improving students' writing skills. However, teaching practice should of course continue to include encouraging students to enjoy writing, and develop their confidence in writing.

15 Learning Media (2006), p 49



ACHIEVEMENT IN MATHEMATICS

Aspects of mathematics

The studies or data sources which assess mathematics achievement are: NEMP (Years 4 and 8), asTTle (Years 4-12), TIMSS (Years 5 and 9), PISA (15-year-olds) and NCEA (Years 11, 12 and 13).

The NEMP mathematics framework statement is: confident understanding and application of mathematical ideas, procedures and processes. The areas of knowledge assessed are:

- number
- measurement
- geometry
- algebra
- statistics.

The processes assessed are:

- problem-solving
- logical reasoning
- information
- computation
- communicating.

asTTle assesses eight mathematics curriculum content areas:

- number knowledge
- number operations
- algebra or patterns in number
- geometric operations
- geometric knowledge
- measurement
- statistics
- probability.

In TIMSS the Year 5 mathematics content areas are:

- number
- patterns and relationships
- measurement
- geometry
- data.

For TIMSS at Year 9 the content areas are the same except *patterns and relationships* becomes *algebra*.

For PISA mathematical literacy is the "capacity to identify, understand and engage in mathematics, and to make well-founded judgements about the role mathematics plays in an individual's current and future private life, social life with peers and relatives, and life as a constructive, concerned and reflective citizen"[16]. PISA 2003 (when mathematics literacy was the major domain) measured four dimensions of mathematical literacy: *quantity, uncertainty, space and shape*, and *change and relationships*.

NCEA has a wide range of achievement standards in the NCEA learning area *Mathematics*. The chapter mentions results for the numeracy requirements for level 1 NCEA, which gives a broad picture of student achievement. Not all students enter for mathematics standards at senior secondary school so the population for NCEA results differs from that of other studies. Also, the NCEA standards lead to formal qualifications, so the purpose of assessment is also different. NCEA results and assessment study findings should therefore be compared cautiously.

16 OECD (2004a), p 37

Overall mathematics achievement

All the studies show that students' performance in mathematics increases overall from year to year of schooling, in a broadly similar pattern to reading. For example, NEMP showed progress in student achievement between Years 4 and 8, and asTTle showed this continuing to Years 11/12. Students on average reached curriculum level 5 by Years 11/12.

In an international context, New Zealand students' performance in mathematics improves relative to the international mean from primary through to middle secondary levels. TIMSS 2002 showed that Year 5 students performed at about the international average, and Year 9 students performed significantly above the international average. PISA 2003 shows the pattern continuing; New Zealand 15-year-olds' performance in mathematics was within the group of second-highest performing countries, and significantly higher than the OECD mean. In 2004, 86 percent of all candidates at Year 11 met the NCEA Level 1 numeracy requirements.

New Zealand students' performance in mathematics has a wide spread compared to other high-performing countries, though not so wide as in reading.

According to PISA, New Zealand students' performance in mathematics has a wide distribution of achievement scores – the range of scores between the highest and lowest performing students – compared to some other high-performing countries. For example, the average scores for Canada and New Zealand were not significantly different, but while Canada recorded one of the narrowest distributions, New Zealand recorded one of the widest. That is, not only do we have a larger proportion of students in the lower levels of achievement compared to Canada, we also have a larger proportion of students in the higher levels of achievement. "This suggests that educational programmes, schools and teachers may not be appropriately addressing the wide range of student knowledge and skills that exist within the New Zealand education system."[17]

Student performance in mathematics has been generally stable in recent years, although NEMP provided evidence of modest improvement in mathematics between 1997 and 2001. Also, TIMSS showed that significantly higher proportions of Year 5 New Zealand students achieved at or above the high, intermediate, and low international benchmarks[18] in 2002 relative to 1994. In contrast, at Year 9, TIMSS showed no change over this time period. PISA 2000 and 2003 showed no significant change for 15-year-olds in average achievement over this period, though because mathematics was a minor domain in 2000, comparisons were possible only on two of the four PISA dimensions: *space and shape* and *change and relationships*.

Findings from the Numeracy Development Project[19] showed that improved classroom teaching, together with use of research and in-class support and workshops to raise teacher confidence and knowledge, resulted in improvements in students' numerical skills[20].

Mathematics achievement by student year

asTTle showed that students' average achievement in mathematics increased through curriculum levels with progression through their school years. At Year 8 the average gain was stronger than at other years of schooling. NEMP showed Year 8 students achieving better than Year 4 students on the same mathematics tasks by between 23 and 28 percent, depending on which curriculum strand was being assessed.

Mathematics achievement by gender

Studies show that girls' and boys' mathematics achievement differs, though findings also differ across studies and year levels.

- At *Year 4*, 2001 NEMP results showed differences between and girls' and boys' performance in only a very few of the NEMP tasks, but where there was a difference, boys scored higher in most of these.
- At *Year 5*, TIMSS results showed that boys and girls were achieving at about the same level.
- At *Years 6 and 7*, asTTle showed that boys have a small advantage in overall achievement in mathematics.
- At *Year 8*, NEMP results showed boys' performance was better in most of the few items where there was a difference, but asTTle showed a small advantage in favour of girls.
- *Year 9* boys and girls achieved at about the same level according to TIMSS, though asTTle showed a slight advantage to girls.

17 Ministry of Education (2004d), p 4

18 The TIMSS international mathematics expert group identified four points on the mathematics scales for use as international benchmarks. For definitions of the benchmarks, see Ministry of Education (2004e), p 6.

19 The Numeracy Development Project is a professional development programme for mathematics teachers.

20 Ministry of Education (2005d), p 2

- Boys at 15 years old, mostly *Year 10*, according to PISA 2000 and 2003 results, had a small, but statistically significant, advantage compared to girls. This difference, however, was much smaller than that in favour of girls in reading. Again, asTTle shows the advantage to girls.
- NCEA results[21] at Year 11 for 2003 showed that girls performed slightly ahead of boys. In NCEA Level 1 numeracy requirements, 86 percent of Year 11 girls met the requirements, while the boys had a slightly lower rate at 83 percent. In 2004, the results were very similar – 87 percent of girls compared to 85 percent of boys. asTTle findings are consistent with a slight advantage to girls.

Overall, the results of the various studies show only slight differences in performance in mathematics between girls and boys. However, the 2004 Numeracy Development Project findings suggest that boys make faster gains than girls at higher levels of the Numeracy Framework[22].

Mathematics achievement by ethnicity

Overall, Pākehā[23] and Asian students' achievement in mathematics is higher at all school levels than that of their Māori and Pasifika peers.

asTTle showed that the mathematics achievement of Pākehā/NZ European and Asian/Other students was higher throughout primary and secondary schooling compared with Māori and with Pasifika. 2001 NEMP results also showed non-Māori students scoring higher than their Māori peers on many tasks at both Years 4 and 8. TIMSS confirmed this pattern for 2002 with the finding that Pākehā and Asian students performed better, on average, than Māori and Pasifika at both Years 5 and 9.

Table 4 shows that in 2004, Year 11 Pākehā and Asian students performed better than their Māori and Pasifika peers in the numeracy requirements for NCEA Level 1.

TABLE 4

Percent of Year 11 candidates who met NCEA Level 1 numeracy requirements by ethnic group, 2004	
Ethnic group	**Percent**
New Zealand European	90
Māori	75
Pasifika	75
Asian	90
Other	87
Total	**86**

A consistent story was told by the number of National Qualification Framework (NQF) credits achieved across all of the domains – areas of assessment – of Year 11 mathematics in 2004 for different ethnic groups – see Table 5.

TABLE 5

Average number of credits achieved in all mathematics domains by ethnic group, Year 11, 2004	
Ethnic group	**Average number of credits**
New Zealand European	19
Māori	15
Pasifika	14
Asian	21

21 NCEA and asTTle findings relate to different populations of students; asTTle data is based on a representative sample of all students at each school year, whereas NCEA results relate to candidates who have gained at least one NQF credit in a given year. Also, some Year 11 and 12 students choose not to do mathematics at all, so the population of Years 11/12 students studying mathematics differs from the population of students in earlier years who study mathematics even within the same study. NCEA assessments lead to formal qualifications whereas asTTle assessments have relatively low stakes for the student. Differences in findings should therefore be treated cautiously.

22 Higgins, J., Irwin, K.C., Thomas, G., Trinick, T. and Young-Loveridge, J. (2005)

23 Different data collections classify and label ethnic groups differently. For example, NEMP uses 'Pākehā' while NCEA uses 'European'.

asTTle showed that the rate of increase in mathematics scores varied between different school years for the different ethnic groups. Māori and Pasifika students started at Year 5 with lower average scores than Pākehā/New Zealand European and Asian students. This disparity persisted at Years 11/12. Pākehā/NZ European students' achievement accelerated from Year 7 to Year 8, while Māori students showed this acceleration a year later at the start of secondary school. Pasifika students were later still, at Years 11/12.

Some evidence is emerging that the ethnic gap in mathematics achievement is narrowing. When Year 5 results from TIMSS 2002 are compared with TIMSS 1994 and 1998, the ethnic disparity decreased for both Māori and Pasifika[24]. Furthermore, in 2002 significantly higher proportions of Māori students achieved at or above all four international benchmark levels. Pasifika students also had significant shifts. These Year 5 results are promising, but no similar trend appears in TIMSS results for Year 9 in 2002, and NEMP results show a similar gap in 2001 as in 1997 between Māori and non-Māori.

The recent Numeracy Development Project findings also suggest that the disparity between Māori and Pasifika and their peers' achievement in mathematics may be closing, especially in schools where additional funding support has focused on adding value to the core numeracy work[25].

Mathematics achievement by whether English is spoken at home

Students who speak English at home generally achieve better in mathematics than those who mostly speak a language other than English.

asTTle results showed that, on average, primary school students who predominantly use a language other than English at home had lower mathematics achievement than their only or predominantly English-speaking peers.

In TIMSS 2002, Year 5 students who always, or almost always, spoke English at home achieved better, on average, in mathematics than those who sometimes or never did. However, Year 9 students who sometimes or never spoke English at home did better than those who always or almost always did.

PISA showed that 15-year-old students who mostly speak a language other than English at home achieved, on average, lower scores in mathematics than students who mostly speak English at home. However, asTTle results, while showing the same relationship, differed in the trend analysis. They showed the gap narrowing through primary years and closing from Year 7 onwards.

Mathematics achievement by school decile

Recent findings from the New Zealand Numeracy Development Project are showing that professional development for teachers and evidence-based teaching practice result in higher mathematics achievement for students in low decile schools. For example, students in schools in the Manurewa Enhancement Initiative perform better than low-decile schools generally[26].

However, studies based on data collected in the period 2000-2004 which show some relationship between school decile and students' mathematics achievement – students from very low deciles on average achieved less well than those from higher deciles. However, the relationship is not straightforward and different studies show rather different pictures. A more important issue is that mathematics achievement has a wide spread within individual schools. The spread between different groups of schools is less significant.

asTTle data collected 2000-2004, showed that primary school student performance in mathematics varied strongly with school decile; students in higher decile schools score more highly. However, secondary school student performance in mathematics was similar in all school deciles except decile 1 where student achievement was much lower than other deciles.

Year 11 mathematics candidates in decile 1 and 2 schools gained fewer NCEA credits than other mathematics candidates. At Year 12 an almost linear relationship appeared between decile and average credits, but at Year 13, while little overall decile effect appeared, decile 1 schools' mathematics candidates achieved far fewer credits.

For PISA 2000 and 2003, the socio-economic status (SES) of students showed a statistically significant gradient of increasing achievement in mathematics with increasing SES. However, not all low SES students performed poorly and many performed to a high level. The performance of low SES students varied across demographic subgroups; girls, Pākehā, those with fewer than three siblings, and those from high decile schools or single gender schools were more likely to be high achievers than their peers.

24 Ministry of Education (2006b)

25 Higgins, J., Irwin, K.C., Thomas, G., Trinick, T. and Young-Loveridge, J. (2005)

26 Ministry of Education (2005d), p 2

School decile and individual student SES are different variables – for example, some low SES students go to high decile schools. More research would be useful to explore exactly how SES affects mathematics achievement, and the relationships between school decile and student SES.

PISA 2003 showed that a very wide spread of mathematics achievement exists *within* individual New Zealand schools compared to other OECD countries. However, the spread *between* different groups of schools is lower than the OECD average[27].

As with reading, the evidence suggests that we should pay as much if not more attention to disparity in mathematics achievement within individual schools than between different groups of schools, such as deciles.

Achievement in mathematics content areas

Students' performance in the various mathematics content areas measured in asTTle advanced year by year in a broadly similar way for all content areas, though according to some evidence, achievement varies between content areas.

In asTTle, students' performance in *geometric knowledge* showed a decrease from Year 5 to Year 6 but then increased after Year 7. Achievement in *geometric operations* plateaued in Years 8 and 9, and achievement in *measurement* plateaued between Years 9 and 10. Some evidence exists from teacher reports that, for *geometry* compared with other mathematics content areas, students were not expected to have engaged with all of the topics of the curriculum.

NEMP results on *measurement* and *geometry* showed little change between 1997 and 2001. However, there was evidence of substantial improvement in *algebra* and *statistics*.

According to TIMSS 2002, Year 5 students had a relative strength in *geometry* and *data*, but a relative weakness in *number*. Girls performed better than boys in *geometry*. In Year 9, students were strongest in *data* and weakest in *number* with no significant gender differences.

NCEA results[28] showed widely different rates of achievement for mathematics content areas. At NCEA Level 1, the results for 2004 show that *number* was the achievement standard with the highest rate (78 percent) of 'achieved' results (including at merit or excellence). *Geometry* had the second highest rate (71 percent). *Probability* and *algebra* had noticeably lower rates (56 percent and 57 percent respectively).

At Level 2, *calculus* stood out as having a lower rate of 'achieved' results (40 percent in 2004) compared to other achievement standards. Then at Level 3, the lowest rate of 'achieved' results in any mathematics achievement standard was 62 percent, and *statistics* was the highest at 88 percent. The higher rates at Level 3 reflect that, on average, the more able senior secondary students stay on at school and select subjects they do well in.

Results from a range of studies showing variable achievement across mathematics content areas suggest that it may be worthwhile to investigate the reasons for this at different school year levels and curriculum levels.

Attitudes to mathematics

As with reading and writing, the various studies do not show any clear or consistent relationship between attitudes and mathematics achievement.

asTTle data on attitudes showed that students who said they liked mathematics the most actually achieved the lowest. Students with medium or low liking of mathematics scored at the same average achievement level; but this was higher than that of students with high liking for mathematics. Both boys' and girls' liking and confidence in mathematics slowly decreased with school year. Boys had more positive attitudes than girls. In mathematics, Asian/Other and Pasifika students generally had more positive overall attitudes than Pākehā/NZ European and Māori students.

Similar to asTTle, NEMP findings on attitudes to mathematics showed that Year 8 students were less positive than Year 4 students.

27 OECD (2004a), p 162

28 The NCEA results described here are based only on externally assessed achievement standards. This is because only these achievement standards, and not those internally assessed, have published numbers of not-achieved results. The proportion of results that are achieved can therefore be calculated only for the externally assessed achievement standards. The population of students entering for externally assessed achievement standards is likely to differ from the population entering for internally assessed standards. So comparisons with other data sources should be made cautiously.

TIMSS 2002 constructs an index of self-confidence in mathematics. A higher proportion of Year 5 boys than girls (58 percent compared to 50 percent) expressed high self-confidence in mathematics. Students who were more confident, whether boys or girls, achieved higher scores in mathematics. About half the Māori, Pasifika and Asian students (50 percent, 49 percent and 51 percent respectively) had a high degree of self-confidence in mathematics, compared with 57 percent of Pākehā/European students.

In Year 9, 49 percent of boys and 38 percent of girls had high self-confidence in mathematics – lower than for Year 5 boys and girls. Students from different ethnic groups at Year 9 also showed the pattern of lower self-confidence than their Year 5 peers, with the exception of Asian students who had higher self-confidence at Year 9 than Year 5. Sixty-nine percent of Asian students had high self-confidence in mathematics compared with Pākehā/European (42 percent), Pasifika (38 percent), and Māori (37 percent).

PISA 2003 collected information on interest, enjoyment and self-confidence in mathematics. The 15-year-old students with greater interest and enjoyment in mathematics tended to achieve better results. Boys expressed much stronger interest in mathematics than girls, though the gender difference in performance was smaller than the gender difference in interest. This seems a different picture from asTTle, but the asTTle results above are aggregated across Years 4 to 12, whereas PISA results are for 15-year-olds only.

The recent European Commission report on evidence from PISA, TIMSS and PIRLS states that self-confidence is positively related to average performance in mathematics and anxiety is negatively related[29].

As with reading and writing, evidence about the relationship between attitudes and achievement in mathematics is not sufficiently consistent to suggest development of policies targeting attitudes alone. However, teaching practice should of course continue to include encouraging students to enjoy mathematics and develop in confidence.

29 Haahr, J. H. (2005), p 137

OVERALL FINDINGS

The *Student Outcome Overview* has outlined findings from a wide range of studies of New Zealand student achievement across primary and secondary schooling years. In most areas, the messages from these studies are very consistent. In a few areas, results are variable.

Common findings across studies

The findings across the studies as a whole are clear that:

- Students advance in learning as they pass through their years of schooling. However, learning does not progress at a constant rate across curriculum levels or across school years.
- New Zealand students achieve in reading and mathematics, on average, at a high level compared to other countries, particularly in mid secondary school. Their average level of achievement has been stable in recent years.
- The highest achieving students in New Zealand are comparable to the best in the world, particularly in reading at mid secondary school.
- New Zealand students have a wide spread of achievement in reading, and to a lesser extent in mathematics, compared to other highly achieving countries.
- Generally, the spread of achievement is wide within individual schools. This means that every school is likely to be working with a diverse range of student achievement and ability. The spread of achievement *within* schools is more significant, particularly in an international context, than the spread of achievement *between* different groups of schools.
- Initiatives such as the Literacy Professional Development Project, the Numeracy Development Project and some school improvement projects have produced very significant positive shifts in reading, writing and mathematics achievement for low achieving students in participating schools, including students in low decile schools.
- Writing is an area where New Zealand students could do better. On average, students do not reach the same curriculum levels as they do in reading or mathematics. The performance in writing amongst some boys is particularly concerning. However, recent findings from the national Literacy Professional Development Project show that significant improvements in writing are occurring in participating schools.
- Though some boys achieve at a very high level, boys are over-represented in those who achieve at a low level, particularly in writing and also in reading. The spread of achievement is wider for boys than girls, particularly in writing.
- Although some Māori and Pasifika students achieve at a very high level, Māori and Pasifika students achieve, on average, less well than their Pākehā and Asian peers. The rate of progress for Māori and Pasifika students across school years and curriculum levels is generally similar to that of Pākehā and Asian students, but Māori and Pasifika students' achievement starts at a lower base and never makes up the gap. However, some evidence – clearest for middle primary reading, writing and mathematics – shows the gap narrowing and Māori and Pasifika average achievement increasing. The achievement of some Māori boys is particularly concerning.
- Students whose home language is English achieve, on average, at a higher level than others especially in reading and writing.

The fact that the different assessment studies' findings closely align in a wide range of areas is compelling evidence that, to a great extent, they measure similar concepts and provide reliable measures of student achievement. Moreover, these common findings give us clear pointers about the aspects of student achievement that are of most concern, and therefore confidence that we can focus further research on the most relevant areas, and develop strategies and responses that will address real problems.

Some areas where findings differ across studies

Findings vary across studies in some areas:

- While assessment studies based on data collected before about 2004 show that students in low decile schools – especially decile 1 – perform poorly on average compared to students in other schools, more recent school improvement projects and the literacy and numeracy projects have shown that significant improvement is occurring in participating low decile schools.
- Some studies show some relationship between student attitudes and achievement, while other studies show little or no relationship. Studies explore different attitudes (liking a subject, perceptions of ability, self-confidence) but no clear overall picture about attitudes emerges.
- Measures of the size and nature of the gap between girls' and boys' achievement in reading achievement vary across studies.

To some extent, variable results across studies may be owing to different studies having differing definitions of the content areas that are assessed, and different student populations. Some studies conduct assessments differently. Different results between studies for small subgroups may be only because of small sample sizes.

Issues about responding to overall findings

Where results are derived from data collected up to five years ago – for example PISA 2000, asTTle, PIRLS 2001 – they cannot reflect student outcomes resulting from recent initiatives and investments in the schooling sector, or even longer established initiatives whose benefits take time to accrue.

The national assessment studies tell us how student achievement is *correlated* or *associated* with characteristics of learners or schools. However, they neither identify what *causes* particular patterns of student achievement, nor how they occur. But findings from these studies do indicate potential areas of further enquiry.

These points indicate that in some areas we should move with caution and carefully review other knowledge about student achievement together with the results of these studies. In particular, a key aspect of developing practical steps for these responses is to reflect on local knowledge about a school's students, teachers, and communities together with the overall picture provided by the national assessment studies whose findings are outlined in this *Overview*.

RESPONSES TO FINDINGS

This chapter outlines some responses to the findings of the *Student Outcome Overview*.

- ***We should continue to build on the successes of New Zealand students.***

Research shows that many New Zealand students achieve very highly indeed when compared both with New Zealand Curriculum expectations and with students from a wide range of countries. Their successes should be acknowledged in schools, and at an education system level, as we develop and implement initiatives for improving student achievement in specific areas. We could undertake further research aimed at understanding more about factors related to these students' successes.

- ***We should continue to participate in a range of different types of studies and research on student achievement.***

The different perspectives that national and international studies can provide on the performance of New Zealand students over time and relative to other countries in key areas, including reading, writing and mathematics, suggest that we continue to use them to track performance to ensure that we are working towards both fairer outcomes for students, and also lifting overall achievement. Findings on student achievement at a national and system level should be reviewed together with local knowledge about a school and its community, detailed research findings about teaching and learning, and also continuous adjustment of teaching practice and interventions in the light of individual student achievement.

- ***We should continue with initiatives to support quality teaching for diverse students developed in the light of research evidence.***

The Ministry's commitment to promoting and supporting quality teaching for diverse students was built in part on the basis of information from studies which assess student achievement at the system level. The studies that have contributed to this report continue to show disparity in achievement across different subgroups of students, although in some areas they provide evidence that the gap is narrowing.

PISA results on *within-school* variability of student achievement reinforce the need for initiatives that support teaching and learning of diverse students who are learning within the *same* school environment. The evidence suggests that this should be more of a focus rather than assuming that diverse students will be in different schools or classes.

- ***We should undertake more research on the impact of curriculum policy on student achievement.***

asTTle provides a direct link between the assessment and curriculum levels. The findings show that some curriculum levels are achieved, on average, in a shorter time than others. Moreover, in writing, the average student achievement does not reach the expected curriculum level. Also, student achievement is variable across mathematics content areas. The rate of progress for Māori and Pasifika students is similar to that of Pākehā and Asian students, but overall Māori and Pasifika students' achievement starts at a lower base and never makes up the gap. However, we do have some evidence that the ethnic gap is narrowing at middle primary level.

Further research could be undertaken on the variability in progress across school years and curriculum areas for boys and girls and for ethnic groups. How important different rates of progress are for long-term achievement is a key question. asTTle findings and other research will be used to improve curriculum refinement and development.

- ***We should continue with the Literacy Professional Development Project, the Numeracy Development Project, and the School Improvement Projects that are focused on achievement issues.***

These projects, which use professional development for teachers and evidence-based teaching, very clearly result in significant improvements in student achievement, especially for low performing students and students in low decile schools. Research related to these projects should continue to investigate in detail the relationships between teacher professional development and shifts in student achievement, and the conditions that bring about these shifts.

- ***We should continue to focus on improving writing within initiatives on literacy achievement.***

The asTTle and NEMP findings consistently demonstrate that writing is a particular challenge for many students, though recent findings from the national Literacy Professional Development Project show significant improvements in writing. Performance gaps also exist in reading. We therefore should continue to concentrate on both, but particularly on writing, as part of the focus on literacy achievement. In future, we would expect to see improvements in student achievement from stronger links between reading and writing, and an emphasis on literacy across the curriculum.

- ***We should continue with programmes that support learning of low-achieving Māori and Pasifika students.***

The assessment studies contributing to this report show clearly that many Māori and Pasifika students achieve well. They also show that we have a relatively high proportion of Māori and Pasifika students who struggle to achieve in reading, writing and mathematics. We have focused on supporting these students in the past, and the research findings suggest that we should continue to do so, given that some evidence is emerging that the gap is narrowing for middle primary students in reading, writing and mathematics, and that improvements occur with the initiatives of the literacy and numeracy projects. Support should take into account the bilingual and multilingual backgrounds of many Pasifika and Māori students. Building knowledge of the needs of these students (such as language learning) will be crucial to making a difference for them.

The evidence also suggests that we should support ongoing work with other agencies that addresses disparity in achievement that can be linked to low socio-economic status.

- ***We should continue initiatives on supporting students with English as a second language.***

Weaker average performance of English-for-speakers-of-other-languages (ESOL) students suggests that the recent high levels of support for these students have not had time to make a noticeable impact. This policy should continue alongside the current policy development on how to support bilingual students in New Zealand schools. Given that the majority of ESOL students are in mainstream classrooms, this issue should be addressed widely across the curriculum, rather than just within the domain of literacy instruction.

- ***We should continue with the focus on improving the achievement of low-achieving boys, including more research on the characteristics of low-achieving boys.***

The finding that some groups of boys have particularly low achievement suggests that the recent policy development focus on boys' achievement will be important. Research that focuses on the characteristics of groups of boys who achieve poorly will be a valuable input into this policy development. Specific areas for research could be gender differences in reading achievement, and what interventions to improve reading work well for boys. Policy work that focuses specifically on improving the achievement of low-achieving Māori boys is under way within the Ministry.

- ***We should consider investigating further the relationships between school decile, student socio-economic status and student achievement.***

The fine-grained information on achievement by school decile provided by asTTle suggests that further research into the relationships between school decile, student socio-economic status and student achievement may be useful. Policy work on how to mitigate the impact of socio-economic status on student achievement could perhaps follow if the research findings provided clear implications.

The relatively low priority of this response relates to the PISA findings that differences in achievement *within* schools are more significant than differences *between* groups of schools. Nearly every school, across all deciles, has students who are not achieving, and the higher priority response on quality teaching for diverse students aims to address this issue.

- ***We should consider developing publicity that explains that within-school differences in student achievement are more significant overall than between-school differences.***

As mentioned above, almost all schools have a wide spread of student achievement. This wide spread of achievement within individual schools is more significant, particularly in an international context, than the spread between different groups of schools – for example, schools of different deciles. Nearly every school has students who achieve very well and also students who are not achieving. School communities may appreciate this information, since it applies so widely. It also relates to parental choices about schools.

- ***We could undertake some research on student attitude and achievement.***

A broad range of research studies world-wide has not been able to establish a consistent link between students' attitudes to a subject (across a spread of forms of attitude) and their performance in that subject. Teaching practice should of course continue to encourage students to enjoy and be confident in their learning. But we do not have evidence that supports aiming to change student attitudes as a means to increase achievement in learning areas. The results from these studies on student attitudes could be further analysed. Also, links between how students view their learning and their achievement could be explored.

Final remarks

These responses are based on evidence synthesised across a range of national and international research and assessment studies. The Ministry of Education believes that they need to be understood together with a wide range of other knowledge and research in order to help most effectively with the development of initiatives and investments leading to students achieving more of their potential.

School communities know, within their own contexts, about their students, schools, teachers and resources for learning. Teachers know how their individual students are performing and, accordingly, fine-tune their teaching. Also, a wide range of research exists on teaching and learning. The findings presented in the *Overview* present a broad picture that can help school communities see how their local settings relate to a national context. All this knowledge needs to be applied to develop practical solutions and initiatives that will help in specific situations.

In line with the *Schooling Strategy*, the overall aim of the responses is both to raise achievement for all students, and also to reduce disparity between different groups of students.

APPENDIX 1: SOURCES OF STUDENT ACHIEVEMENT INFORMATION

New Zealand currently has student achievement data from the following data sets.

TABLE 6

Year level	4	5	6	7	8	9	10	11	12	13
Curriculum area										
Mathematics	asTTle/ NEMP	asTTle/ TIMSS	asTTle	asTTle	asTTle/ NEMP	asTTle/ TIMSS	asTTle/ PISA			
Science	NEMP	TIMSS			NEMP	TIMSS	PISA			
English – reading	asTTle/ NEMP	asTTle/ PIRLS	asTTle	asTTle	asTTle/ NEMP	asTTle	asTTle/ PISA			
English – writing	asTTle/ NEMP	asTTle	asTTle	asTTle	asTTle/ NEMP	asTTle	asTTle		NCEA	
Technology	NEMP				NEMP					
The Arts	NEMP				NEMP					
Health & Physical Education	NEMP				NEMP					
Social sciences	NEMP				NEMP					
Languages										

This table shows New Zealand's participation since 1994 in assessment studies.

TABLE 7

	Year of assessment													
	94	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**
NEMP Yrs 4, 8		✔ Science, Visual Art, Info Skills	✔ Language, Technology, Music	✔ Mathematics, Social Studies, Info Skills	✔ Language, Health & Physical Education	✔ Science, Visual Art, Info Skills	✔ Language, Technology, Music	✔ Mathematics, Social Studies, Info Skills	✔ Language, Health & Physical Education	✔ Science, Visual Art, Info Skills	✔ Language, Technology, Music	✔ Mathematics, Social Studies, Info Skills	✔ Language, Health & Physical Education	✔ Science, Visual Art, Info Skills
asTTLe Yrs 4-12							✔	✔	✔	✔	✔			
PIRLS Yr 5								✔				✔		
TIMSS Yr 5	✔				✔				✔				✔	
TIMSS Yr 9	✔				✔				✔					
PISA 15-yr-olds							✔ main domain: reading			✔ main domain: mathematics			✔ main domain: science	
NCEA [30] Yrs 11-13									✔	✔	✔	✔	✔	✔

30 NCEA qualifications were introduced in 2002. The NCEA level 1 qualification was first available in 2002. NCEA level 1 is the qualification typically gained by Year 11 candidates, while NCEA level 2 and level 3 are the qualifications typically gained by Year 12 and Year 13 candidates respectively.

This table summarises some further key information about studies of student achievement.

TABLE 8

	asTTle	NEMP	PIRLS	PISA	TIMSS	NCEA
Full title of study	Assessment Tools for Teaching and Learning	National Education Monitoring Project	Progress in International Reading Literacy Study	Programme for International Student Assessment	Trends in International Mathematics and Science Study	National Certificate of Educational Achievement
Administering body	University of Auckland	Educational Assessment Research Unit (EARU), Otago University	IEA (International) & Ministry of Educcation (MoE)	OECD (International) & Ministry of Educcation (MoE)	IEA (International) &	New Zealand Qualifications Authority (NZQA)
Mathematics	Yes	Yes	No	Yes	Yes	Yes
Writing	Yes	Yes	No	No	No	Yes
Reading	Yes	Yes	Yes	Yes	No	Yes
Number of NZ students	Nearly 100,000	1,400 Y4 & 1,400 Y8	Nearly 2,500 in PIRLS. 1,200 in 10 yr Trends in Reading Literacy Study	3,667 (2000) 4,500 (2003)	4,300 Y5 & 3,800 Y9 from 390 schools	Approx 145,000
Age of students	Approx 9-17	9 & 13	10	15 yrs 3 mths-16 yrs 2 mths	10 & 14	Approx 15-18
School year	Y4-12	Y4 & Y8	Y5	Mostly Y10	Y5 & Y9	Mostly Y11, 12 and 13
Year of study	2000-2004	Annually since 1995	2001, 2005	2000, 2003, 2006	1994, 1998, 2002, 2006	Level 1: from 2002 Level 2: from 2003 Level 3: from 2004
National/international	National	National	35 countries	2000: 32 countries 2003: 42 countries	2002: Y5: 25 countries Y9: 46 countries	National
Language of test	English & Māori	English & Māori	English & Māori	English	English	English & Māori
Match to NZ Curriculum (NZC)	Assessments developed from NZC	Majority of items	Some items	Some items	60-80 percent of items	Assessments developed from NZC

Across these studies the Ministry of Education has looked to:

- ensure high standards of implementation, analysis and reporting
- foster connections among international and national assessment surveys to inform Ministry and sector decision-making
- focus on secondary analysis of international data sets and build capability in areas that will support this analysis
- create and take opportunities to disseminate results to a range of stakeholders.

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www.educationcounts.edcentre.govt.nz

Other websites

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NEMP: ***nemp.otago.ac.nz***
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PIRLS: ***www.pirls.org***
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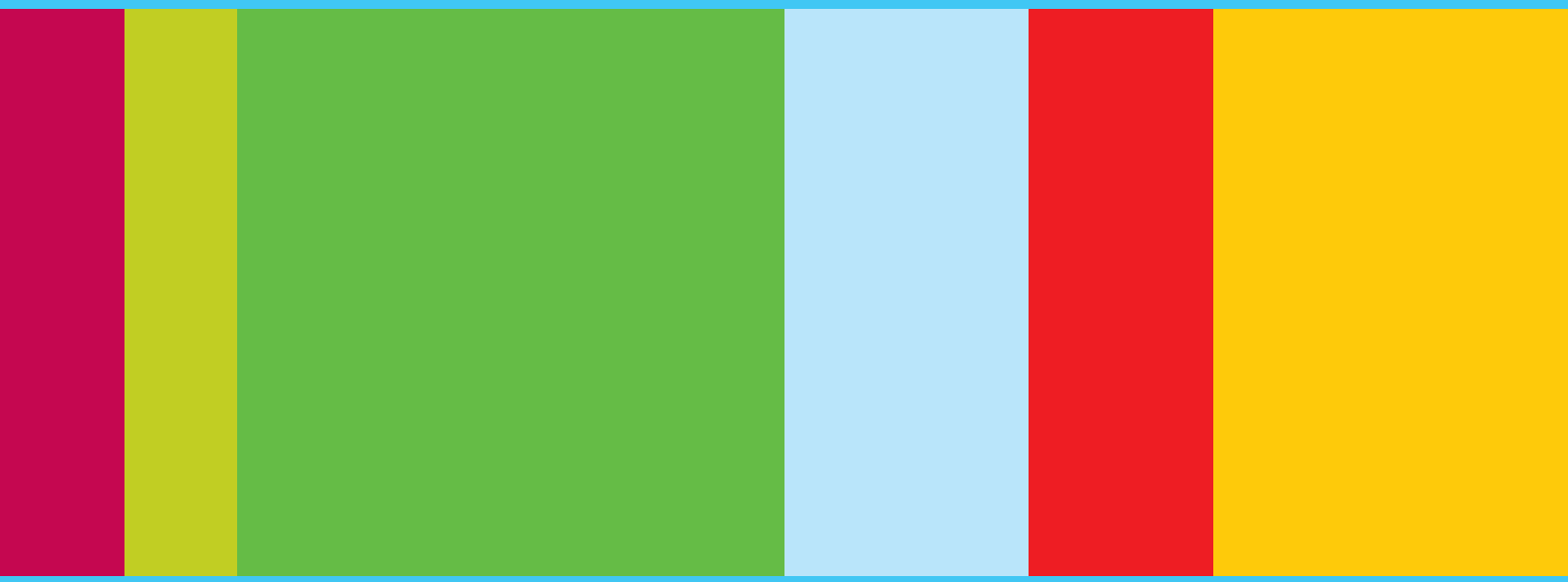

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