CHAPTER 4: The Students

KEY POINTS

- The demographic profile of the New Zealand Year 5 sample in 1998 was similar to that of the Year 5 sample in 1994.
- The proportion of Year 5 students indicating that English was not spoken very often in the home was about the same in 1998 as it was in 1994.
- The relative proportions of the different household structures in which New Zealand Year 5 students resided were also similar in both years.
- Those Year 5 students with many books in their home had higher mean scores in mathematics and science, in both 1994 and 1998.
- The number of students with a computer in the home increased from 53 percent in 1994 to 66 percent in 1998.
- Watching television and videos remains the most preferred leisure activity for Year 5 students in 1998.
- The proportion of Year 5 students are doing mathematics homework on a typical school day increased from 79 percent in 1994 to 88 percent in 1998. Similarly, the proportion of students doing science homework increased from 45 percent in 1994 to 53 percent in 1998.
- Over half of New Zealand Year 5 students expressed positive or very positive attitudes towards mathematics in 1998. Likewise, more than half of students had positive or very positive attitudes towards science in 1998.

The performance of Year 5 students in mathematics and science is determined not only by cognitive factors but also by the influences of the home, attitudes to schoolwork, watching television, etc. Previous IEA studies both internationally and nationally, have investigated the effects of a broad range of contextual background factors. This information has been drawn from students, teachers, and schools. The results in this chapter focus on the data collected from the student questionnaire administered during 1998[1]. In addition, direct comparisons will be made with the data collected from 1994, as is the case throughout this report[2]. In some cases achievement scores are provided to illustrate the variation between population sub-groups.

DEMOGRAPHIC VARIABLES

This section focuses on the demographic makeup of the (weighted) 1998 sample, including breakdowns by gender, ethnicity, country of origin, and home language. Mathematics and science performance has been discussed with regard to gender, ethnicity and home language in Chapters 2 and 3. Performance will be further examined in this section with regard to the student's country of origin.

As much of the discussion in this report compares the TIMSS results of the 1998 cohort with those of the 1994 cohort, these two samples are compared. In general, these samples were found to have very similar demographics.

Gender

The Year 5 sample for 1998 was 49 percent girls and 51 percent boys. Table 4.1 shows a comparison between the national population figures and the selected sample, alongside the equivalent figures reported for the original study in 1994. In 1998 the proportion of girls and boys selected in the sample was the same as that found in the Year 5 population.

TABLE 4.1 PROPORTION OF YEAR 5 GIRLS AND BOYS PARTICIPATING IN 1994 AND 1998

Students	1994		1998	
	% Girls	% Boys	% Girls	% Boys
Year 5 (sample)	51	49	49	51
Year 5 (NZ population)	49	51	49	51

Note: Source for population figures: Ministry of Education 1995 and 1998.

Age

For both 1994 and 1998 the mean age of the Year 5 students in the sample was 10 years and 0 months. In addition, the age range reported was almost identical in both years (refer to Table D.1 in Appendix D for details).

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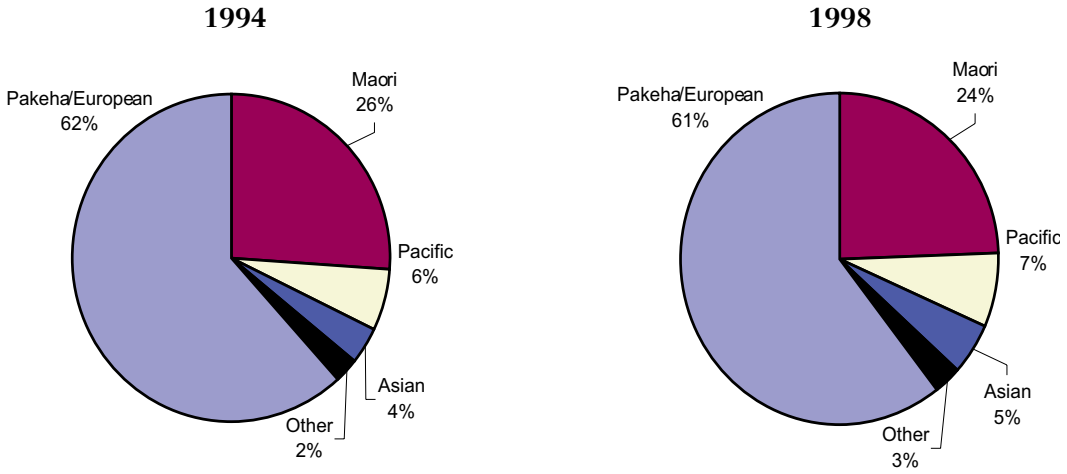
[1] *The analyses in this chapter have been adjusted to exclude missing data – in all cases this is less than 10 percent.*

[2] *The proportions reported in this chapter for 1994 may differ from those reported by Martin (1997). This is due to the fact that when first reporting the information collected in 1994, the responses from standards 2 and 3 students were often combined. The responses were also from those students who completed a student questionnaire regardless of whether or not they participated in the mathematics and science assessment. The 1994 (and 1998) background information presented here is based on those responses from just the Year 5 (standard 3) students who also took part in the assessment component of the study.*

Ethnicity

Students were asked with which ethnic group(s) they identified. Students who indicated they identified with more than one ethnic group were reallocated to one of five major ethnic groupings based on the procedures detailed in the *Standard Classification of Ethnicity* (Department of Statistics, 1996). The five main groupings are: *Pakeha/European, Maori, Pacific, Asian* and *Other ethnic groups.* Figure 4.1 presents the percentage of students in each main ethnic grouping for both studies.

FIGURE 4.1 PROPORTION OF YEAR 5 STUDENTS IN EACH MAIN ETHNIC GROUPING FOR 1994 AND 1998



There were only small differences in the proportions of students in each of the main ethnic groupings between 1994 and 1998. As the proportion of students categorised as *Other* ethnic groups is very small, their results will not be discussed separately in this chapter (but may be included in the tables in Appendix D).

Country of origin

Year 5 students were asked to indicate whether or not they had been born in New Zealand. Overall in 1998, 12 percent of students reported that they had been born in a country other than New Zealand. This represented a small increase (2 percentage points) since 1994. Students not born in New Zealand were, on average, five and a half years of age when they arrived in New Zealand. Asian and Pacific students were more likely to report that they were born in another country (60% and 20% respectively) than were Pakeha/European and Maori (7% and 5% respectively).

Table 4.2 presents the mean achievement scores for Year 5 students by country of origin — that is, those born in New Zealand and those born elsewhere.

TABLE 4.2 YEAR 5 STUDENTS' MEAN ACHIEVEMENT SCORES IN 1998, BY COUNTRY OF ORIGIN

Country of origin	Proportion of students (%)	Mean achievement score (se)	
		Mathematics	Science
Born in NZ	88	481 (5.4)	517 (5.7)
Not born in NZ	12	491 (10.3)	507 (11.8)

Note: *(se) Standard errors appear in parentheses.*

Interestingly, those students who said they were born in another country attained a marginally higher mean score in mathematics and a marginally lower mean score in science in comparison to their New Zealand-born counterparts. However, neither difference was statistically significant.

Parents' birthplace

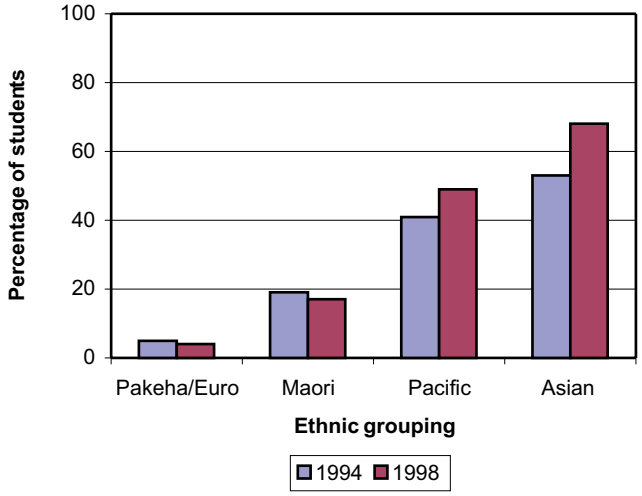
In 1998, approximately three-quarters of Year 5 students reported that their mothers and/or fathers were born in New Zealand. Compared with 1994, there were fewer students who indicated that their mother or father was born overseas (decreases of 6 and 3 percentage points respectively).

Language of the home

Over the last decade, the proportion of Year 5 students who frequently speak a language other than English at home has been steadily increasing (see Caygill, 1993, and Martin, 1996a, 1996b & 1997). In 1998, 15 percent of students indicated that English was rarely spoken in their home — two percentage points more than in 1994 (see Table D.2 in Appendix D for more details).

As Figure 4.2 shows, in 1994 and 1998, it was mainly Asian and, to a lesser extent, Pacific Year 5 students who reported that they came from homes where English was not spoken frequently. Compared with 1994, there were more Asian students and Pacific students in 1998 reporting infrequent use of English at home (increases of 15 and 8 percentage points respectively).

FIGURE 4.2 PROPORTION OF YEAR 5 STUDENTS WHERE ENGLISH WAS SPOKEN ONLY RARELY IN THE HOME FOR 1994 AND 1998, BY ETHNIC GROUPING



Note: *1994 Other ethnic groups = 26%;*
1998 Other ethnic groups = 35%.

The relationship between the frequency of speaking English at home and achievement is outlined in Chapter 3 for mathematics and Chapter 4 for science.

HOME BACKGROUND VARIABLES

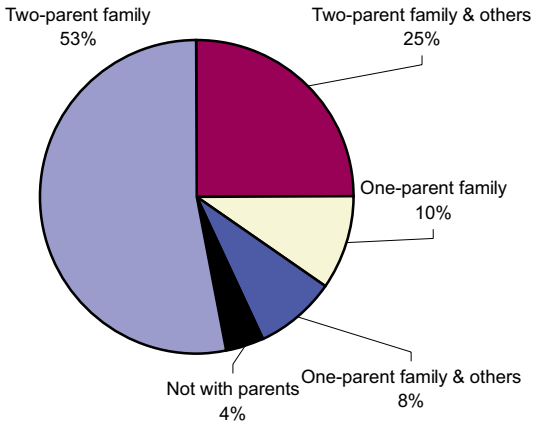
A sizeable body of research has investigated the relationship between student achievement and family size and/or composition (eg Blake, 1989; Lapointe et al, 1992a & 1992b; Thompson et al, 1992; Martin, 1996a, 1996b, & 1997, and Nechyba et al, 1999). The research usually demonstrates a negative relationship between achievement and family size. That is, students residing in larger households tend

to achieve less well on a range of indicators. The research on family composition is more equivocal. One factor in considering why there are disparate findings in such research may be the different cultural contexts in which these studies are undertaken. Another may be that changing social norms, with regard to family composition, give rise to different outcomes over time.

Household composition

Year 5 students were asked to indicate whom they lived with 'most or all of the time'. There was very little change in the household structures in which Year 5 students lived over the period from 1994 to 1998. The most common family structure remained two parents (or stepparents/caregivers) possibly with siblings but without extended family or non-relatives in the house. Figure 4.3 summarises the information reported by Year 5 students in 1998 (family composition figures for both years are available in Table D.3 in Appendix D).

FIGURE 4.3 PROPORTION OF YEAR 5 STUDENTS BY HOUSEHOLD STRUCTURE FOR 1998



Notes:

1 *Parent includes stepparent and/or caregiver.*
2 *'Others' includes non-immediate relatives (grandparents, uncles, aunts, cousins) and non-relatives.*
3 *Not living with parents includes Year 5 students that reported living with relatives other than parents or stepparents.*
4 *The presence of siblings in the home was not germane to the categorisation of family structure.*

Figure 4.4 presents Year 5 students' household structure by ethnic grouping (see also Table D.4) in Appendix D).

In all main ethnic groupings the majority of students lived in a two-parent family environment (with or without others), ranging from 81 percent of Pakeha/European to 71 percent of Maori students. However, almost a quarter (24%) of Maori students lived in one-parent households (with or without others), as did 20 percent of Pacific, 19 percent of Asian and 15 percent of Pakeha/European students.

The most common structure of the two-parent household in which Pakeha/European, Maori, and Asian students lived was a nuclear family household (ie possibly with siblings but without extended family or non-relatives). Pacific students, on the other hand, were more likely to be living in an extended family household with other relatives and/or non-relatives.

FIGURE 4.4 PROPORTION OF YEAR 5 STUDENTS BY HOUSEHOLD STRUCTURE AND ETHNIC GROUPING FOR 1998

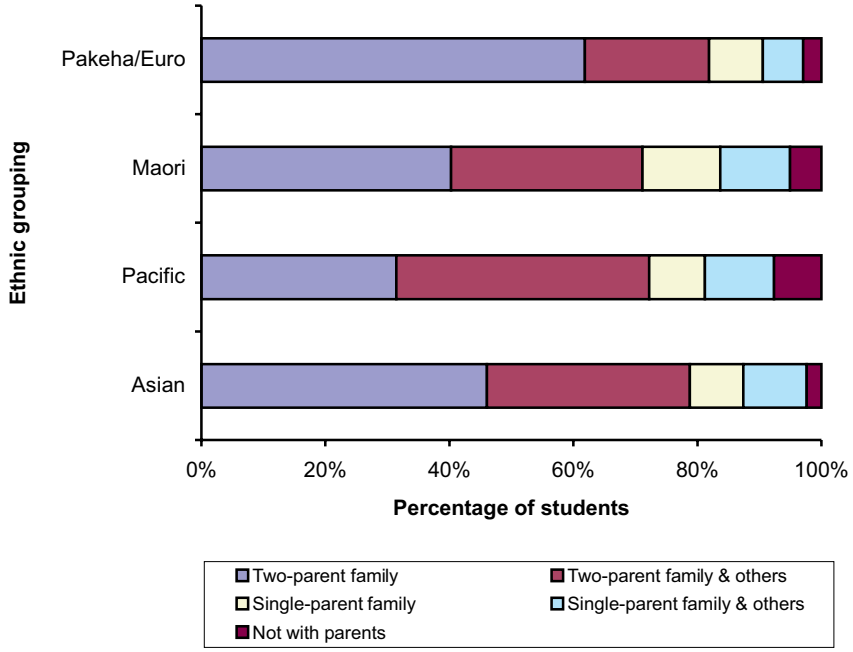
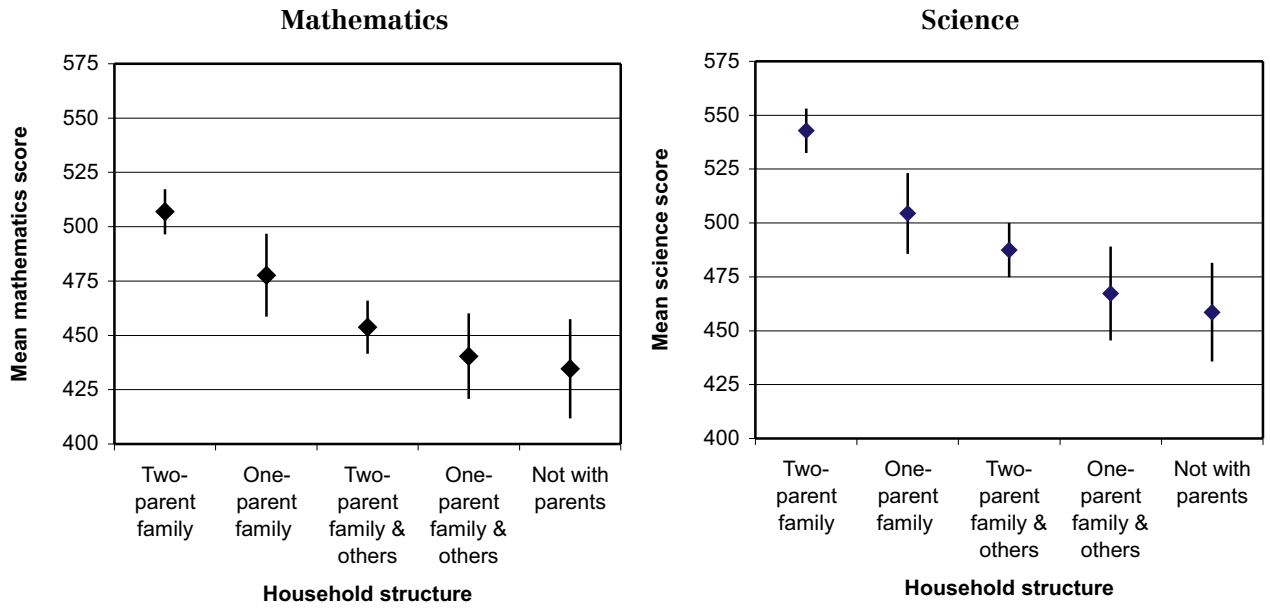


Figure 4.5 provides a graphical illustration of the mean achievement scores (with standard errors) for Year 5 students in each of the household structures (see Table D.5 in Appendix D for details). While the analysis is interesting, it is descriptive only and no causal relationship has been demonstrated or implied.

FIGURE 4.5 YEAR 5 STUDENTS' MEAN MATHEMATICS AND SCIENCE SCORES BY HOUSEHOLD STRUCTURE FOR 1998



The data points are the mean scores. The vertical lines extending from the data points show the 95% confidence interval around the mean, ie ± 2 standard errors.

Household size

Students were also asked to indicate the total number of people living in their home. In 1998, over three-quarters of students reported living in homes ranging from four to six people, with 97 percent residing in households of between two and eight. The corresponding results in 1994 were almost identical.

In 1998, eight percent of Pacific Year 5 students resided in households of nine or more people compared with three percent across the other ethnic groupings. In 1994 there were 14 percent of Maori, 11 percent of Pacific, five percent of Asian and one percent of Pakeha/European students living in households of nine or more. Thus, compared with 1994, there were proportionally fewer students from every ethnic grouping, except Pakeha/European, residing in such large households. This difference was especially marked for Maori students.

SOCIAL AND ECONOMIC BACKGROUND

Numerous national and international studies have identified a positive relationship between the socio-economic status (SES) of student households and student achievement in schools. That is, students from a high SES background tend to achieve better on a range of indicators (Fergusson et al, 1991; Lapointe et al, 1992a & 1992b; Caygill, 1993; Nash & Harker, 1994; and Martin 1996a, 1996b & 1997).

The SES of students is normally measured by collecting information on the parents' occupations, education and income. However, in many countries it is not possible to obtain reliable information on parental income, occupation or education. Therefore surrogate measures of educational resources and wealth were used based on variables such as the number of books in the home, the presence of a computer, dictionary, study desks, calculators and certain non-essential items in the home. The following discussion examines these variables and their relationship to achievement.

Books in the home

The number of books in the home provides an indicator of household literacy resources. In previous IEA studies, home literacy resources have been found to be strongly associated with student achievement (Elley, 1992; May & Wagemaker, 1993; and Martin, 1997). In 1994 and 1998 students were asked to estimate the number of books in their home. Students' responses have been grouped into three categories and are presented in Table 4.3.

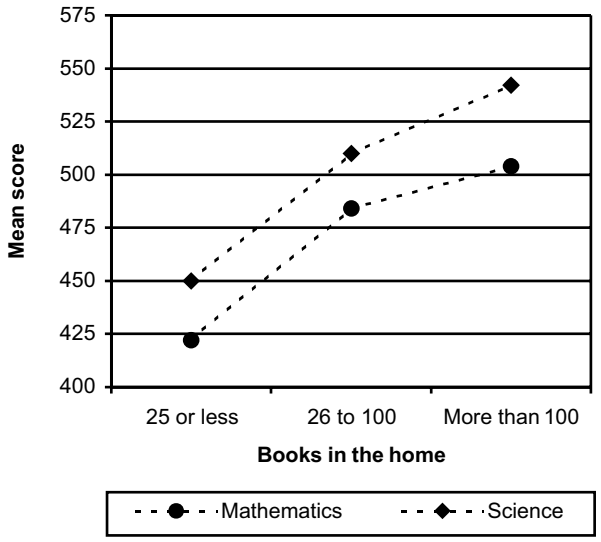
TABLE 4.3 PROPORTION OF YEAR 5 STUDENTS' ESTIMATES OF THE NUMBER OF BOOKS IN THEIR HOMES FOR 1994 AND 1998

Number of books in the home	Proportion of students (%)	
	1994	1998
25 or less	16	18
26-100	22	26
More than 100	62	56

The proportions for 1998 were, with one exception, quite similar to those observed in 1994. The one exception was the six percentage point decrease in the proportion of students indicating they had more than 100 books; this decrease was largely attributed to the change in the 'more than 200' books category. A possible reason for the drop in the largest category of books is that certain books are being replaced by the computer as an informational resource in homes.

Figure 4.6 illustrates the positive relationship between the number of books in the home and mean mathematics and science scores for Year 5 students in 1998. That is, the highest mean scores in mathematics and science were achieved by students with the most books in the home. The differences in mean scores between the lowest and highest performing groups of students were statistically significant for both mathematics and science (α=0.05). (See also Table D.6 in Appendix D for the mean scores and standard errors for both 1994 and 1998.)

FIGURE 4.6 YEAR 5 STUDENTS' MEAN MATHEMATICS AND SCIENCE SCORES FOR 1998, BY THE NUMBER OF BOOKS IN THE HOME



In 1998, about two-thirds of Pakeha/European students indicated that they had more than 100 books in their home compared with 44 percent of Maori and Asian students, and 37 percent of Pacific students. Conversely, nine percent of Pakeha/European reported having 25 or fewer books in the home compared with 29 percent of Maori, 32 percent of Asian and 42 percent of Pacific students (see Table D.7 in Appendix D).

Educational resources

Findings from 1994 showed that students from homes with a wide range of educational resources such as computers had, on average, higher achievement in mathematics and science than students who did not (eg Martin et al, 1997 and Mullis et al, 1997). This section presents the proportions of students reporting they had computers and three additional educational resources in their homes in 1998 only. The relationship between these resources and achievement is also investigated.

Computers in the home

In 1998, two-thirds of Year 5 students reported having a computer in the home, an increase of 13 percentage points since 1994. The increase was generally about the same for each of the four main

ethnic groupings (between 10 and 14 percentage points). Proportionally more Asian and Pakeha/European students had computers at home in 1998 (76% and 73% respectively) than Maori or Pacific students (54% and 45% respectively).

Table 4.4 presents Year 5 students' mean mathematics and science scores by the presence of a computer in the home. As expected, in both mathematics and science there was a statistically significant difference between the mean score of students who had a computer at home and those who did not.

TABLE 4.4 YEAR 5 STUDENTS' MEAN MATHEMATICS AND SCIENCE SCORES, BY A COMPUTER IN THE HOME FOR 1998

Computer	Proportion of students (%)	Mean scores (se)	
		Mathematics	Science
Yes	66	495 (5.2)	530 (5.3)
No	34	456 (7.1)	486 (7.7)

Note: (se) Standard errors appear in parentheses.

Dictionary, Study Desk and Calculator in the home

Students were asked whether they possessed three additional core educational aids in the home: a dictionary, a study desk for personal use, and a calculator. As shown in Table 4.5 three quarters of students reported possessing all three items in 1998. The proportions varied by ethnicity, with 83 percent of Asian, 78 percent of Pakeha/European, 71 percent of Maori and 56 percent of Pacific students reporting possession of all three of these items. Table 4.5 also shows the considerable (statistically significant) difference between the mean mathematics and science scores of those who possessed all three items and those who had less than all three items.

TABLE 4.5 YEAR 5 STUDENTS' MEAN MATHEMATICS AND SCIENCE SCORES, BY THREE EDUCATIONAL POSSESSIONS IN THE HOME FOR 1998

Possession of dictionary, study desk and calculator	Proportion of students (%)	Mean scores (se)	
		Mathematics	Science
Yes	75	497 (4.6)	532 (5.0)
No	25	446 (9.2)	472 (8.8)

Note: (se) Standard errors appear in parentheses.

Non-essential items in the home

Non-essential items (like videos or dishwashers) are more likely to be found in high SES homes and therefore students from these homes would be expected to have higher mathematics and science scores. From 1994 to 1998 there was generally an increase in the proportions of Year 5 students indicating the presence of non-essential items in the home. Table 4.6 lists the home possessions showing more than five percentage points growth between 1994 and 1998. In contrast, there were three home possessions displaying small decreases over the same period — 'musical instruments', 'video games' and 'encyclopaedias'.

On average those students with non-essential items in the home achieved higher mathematics and science scores in 1998. For example, the 14 percent of students who had all of the items listed in Table 4.6 had significantly higher mean mathematics and science scores (512 and 546 respectively) than those who had only some or none of these items (480 and 514 respectively).

TABLE 4.6 PROPORTION OF YEAR 5 STUDENTS WITH THE HOME POSSESSIONS FOR 1994 AND 1998

Home possessions with >5% increase between 1994 and 1998	Proportion of students (%)	
	1994	1998
CD player	67	86
Video camera	34	40
Microwave	79	85
Dishwasher	50	61
Two bathrooms	33	39
Mobile/cellular phone	47	65

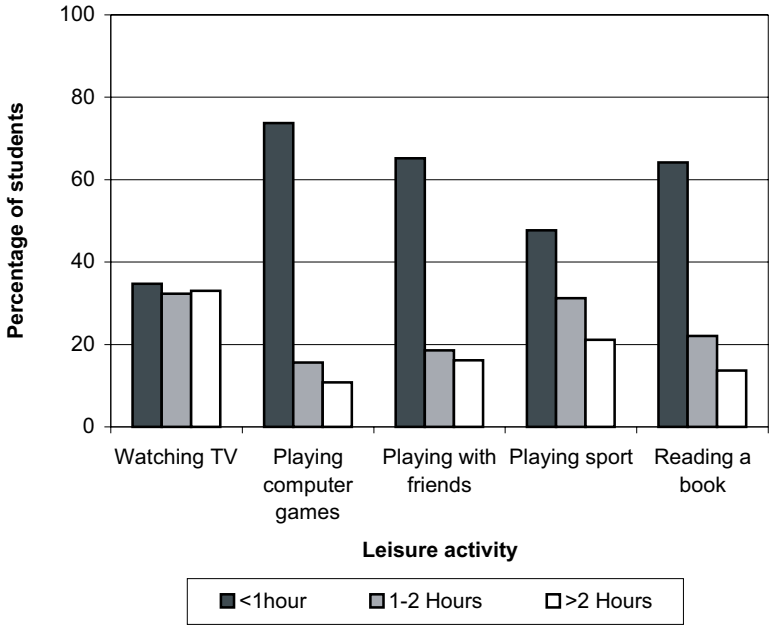
OUT-OF-SCHOOL ACTIVITIES

Year 5 students were asked to indicate how much time they spent on a range of out-of-school activities, including time on homework, on a normal school day.

Leisure activities

Leisure activities are examined for a number of reasons. On the one hand, leisure activities may provide positive educational experiences (eg improving reading skills). On the other hand, engagement in leisure activities may reduce the opportunity to do schoolwork at home. The proportion of students involved in the leisure activities for 1998 is in Figure 4.7.

FIGURE 4.7 AMOUNT OF TIME YEAR 5 STUDENTS SPENT ON LEISURE ACTIVITIES ON A NORMAL SCHOOL DAY FOR 1998



Students were asked to indicate how much time before or after school on a 'normal school day' they engaged in the following leisure activities: watching television and videos, playing computer games, playing or talking with friends, playing sports, and reading a book for enjoyment.

There was virtually no change in the proportion of students participating in any of these activities from 1994 to 1998. Watching television or videos continued to be the most popular leisure activity (about 90% of students indicated they spent some time on this activity) whereas computer games proved to be the least frequently occurring activity for Year 5 students (approximately 60% reported this).

Television and video viewing

Previous IEA studies have highlighted the generally negative relationship between excessive television watching and student achievement in general, and mathematics and science achievement in particular (Lamb, 1987; Elley, 1992; Caygill, 1993; and Martin 1996a, 1996b & 1997). Thus, examining the television viewing results in more detail was important.

Gender analyses for 1998 show little difference in the overall proportions of Year 5 boys and girls watching television. However, there were more boys (19%) than girls (13%) in the 'heaviest' viewing category (more than four hours a day). In addition, 35 percent of girls watched television for '1-2 hours' compared with 30 percent of boys. For more details about the results in both 1994 and 1998 see Table D.8 in Appendix D.

Table 4.7 shows the television and video viewing information by ethnic grouping. In 1994 the proportion of Pacific and Asian students not watching any television on a school day was about twice that of Pakeha/European and Maori Students (19% and 17% compared with 10% and 7% respectively). Four years later, the proportion of students not watching television on a school day ranged from eight percent (Asian) to 13 percent (Pacific). This reflects little change for Pakeha/European and Maori but a reduction for Pacific and Asian, so that the proportions across ethnic groupings are more similar than they were in 1994.

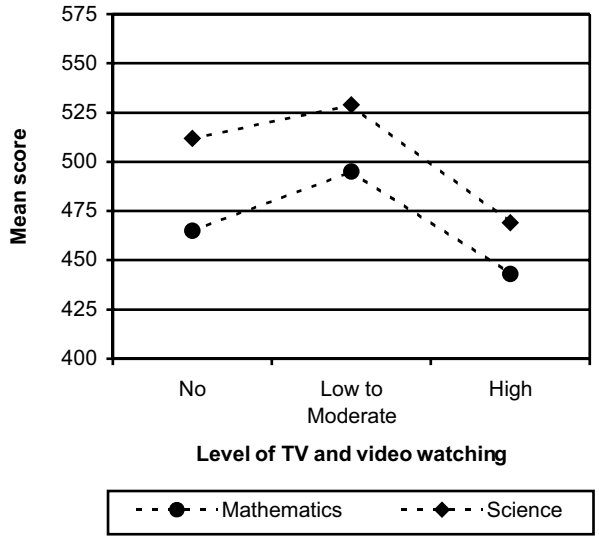
TABLE 4.7 AMOUNT OF TIME YEAR 5 STUDENTS SPENT WATCHING TELEVISION AND VIDEOS ON A NORMAL SCHOOL DAY FOR 1994 AND 1998, BY ETHNIC GROUPING

Ethnic grouping	Television and video watching									
	1994					1998				
	No time (%)	Less than 1 hr (%)	1-2 hrs (%)	3-4 hrs (%)	More than 4 hrs (%)	No time (%)	Less than 1 hr (%)	1-2 hrs (%)	3-4 hrs (%)	More than 4 hrs (%)
Pakeha/European	10	27	35	14	14	9	25	34	18	13
Maori	7	23	24	19	28	9	25	27	15	24
Pacific	19	24	21	7	29	13	24	28	12	23
Asian	17	24	34	15	11	8	33	38	12	8

In 1998, Maori and Pacific students (at 24% and 23% respectively) were twice as likely as their Pakeha/European counterparts, and three times as likely as Asian students, to be heavy television viewers (ie watch for more than four hours on a school day). There were similar proportions four years earlier.

In order to examine the relationship between television and video watching and achievement, the time spent watching was collapsed into three broad categories. These were low level — less than an hour a day (including no time), 35 percent of students; moderate level — one to four hours, 49 percent of students; and high level — more than four hours a day, 16 percent of students. Figure 4.8 provides an illustration of the negative association between high levels of television and video watching and achievement in both mathematics and science.

FIGURE 4.8 YEAR 5 STUDENTS' MEAN MATHEMATICS AND SCIENCE SCORES, BY THE LEVEL OF TELEVISION AND VIDEO WATCHING FOR 1998



In both mathematics and science, students who were high level television viewers scored significantly lower mean scores than moderate or low level television viewers. There was no statistical significance in the difference between the mean scores of low and moderate level television viewers in either mathematics or science.

Reading a book for enjoyment

Engaging in reading books, especially at the middle primary level where students are generally shifting from learning to read to reading to learn, can also provide more general academic benefits. Gender and ethnic differences in time spent reading a book for enjoyment are investigated here.

From 1994 to 1998 there was a small increase in the proportion of boys engaging in some reading of books for enjoyment on a normal school day — from 70 to 75 percent. In comparison, the number of girls reading books for enjoyment remained about the same — 88 percent in 1998. For details see Table D.9 in Appendix D.

Table 4.8 provides a breakdown of students' reports of reading a book for enjoyment on a school day by main ethnic grouping. The largest increase in reading books for enjoyment from 1994 to 1998 was observed for Pacific students (10 percentage points). The proportions of Asian and Maori students engaged in this activity also increased (by 5 and 4 percentage points respectively).

TABLE 4.8 AMOUNT OF TIME YEAR 5 STUDENTS READ BOOKS FOR ENJOYMENT ON A NORMAL SCHOOL DAY FOR 1994 AND 1998, BY ETHNIC GROUPING

Ethnic grouping	Reading a book for enjoyment							
	1994				1998			
	No time (%)	Less than 1 hr (%)	1-2 hrs (%)	More than 2 hrs (%)	No time (%)	Less than 1 hr (%)	1-2 hrs (%)	More than 2 hrs (%)
Pakeha/European	18	49	22	11	17	47	23	13
Maori	29	44	16	11	25	45	17	13
Pacific	27	38	22	13	17	39	24	20
Asian	15	44	27	14	10	39	32	19

Doing odd jobs

Seventeen percent of Year 5 students reported spending no time on 'odd jobs' about their home in 1998, about the same as the proportion observed four years earlier. Among those students who responded that they did odd jobs, a slightly higher proportion reported spending less than one hour in 1998 (56%) than was the case in 1994 (53%) but this was offset by a very small reduction at the high end (ie more than two hours a day) over the same period (down from 10% to 8%).

Homework

Numerous studies have investigated the relationship between homework and student achievement (eg Walberg et al, 1985; Walberg, 1993; Caygill, 1993; and Martin, 1996a, 1996b & 1997). In general, the completion of regular homework provides the opportunity for reinforcement that potentially leads to improved class work. Year 5 students were asked, on a typical school day, how much time before or after school they spent doing mathematics, science, and 'other' homework (not mathematics and science).

Higher proportions of Year 5 students in 1998 than in 1994 reported that they spent at least some time on homework in mathematics (up 9 percentage points to 88%), science (up 8 percentage points to 53%), and 'other' subjects (up 5 percentage points to 79%). Mathematics is usually taught on a daily basis, while science is typically taught less frequently. This may account for the discrepancy between the proportion of students doing science homework and the proportion doing mathematics homework. Of those students doing homework, the majority were engaged in homework for less than one hour per day in both mathematics and science. Details of these results, including a breakdown by ethnic grouping, are presented in Table D.10 in Appendix D.

Out-of-School Study Time (OST) Index and Achievement

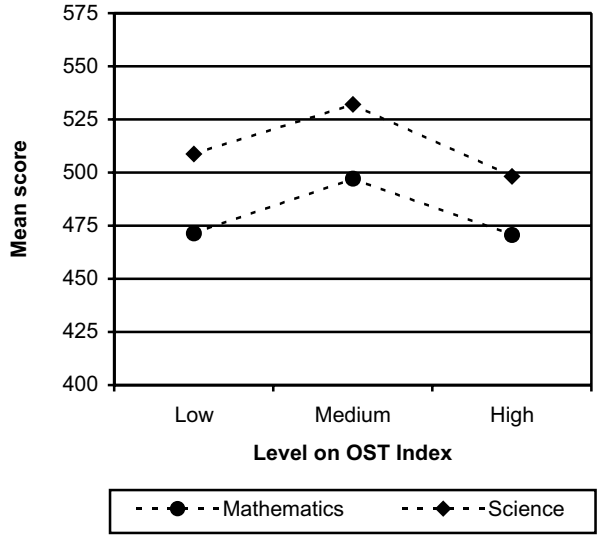
An Out-of-School Study Time (OST) Index was constructed in order to summarise the student information on homework. Similar procedures were used for constructing the index as were used at the lower secondary level and reported in Chamberlain and Walker (2001)[3]. Three categories were used to

[3] *Also see Martin et al, 2000 or Mullis et al, 2000.*

summarise the combined time spent studying before or after school in mathematics, science, and other subjects: low, for less than one hour (including no time); medium, for one to 2.5 hours a day; and high, for more than 2.5 hours per day on homework. Fifteen percent of students were at the low level of the index compared with 58 percent at the medium and 26 percent at the high levels.

As Figure 4.9 illustrates, the relationship between homework and achievement was not linear – students categorised at the medium level of the OST Index achieved, on average, higher scores in both mathematics and science than students at either the low or high levels of the index.

FIGURE 4.9 YEAR 5 STUDENTS' MEAN MATHEMATICS AND SCIENCE SCORES AT EACH LEVEL OF THE OUT-OF-SCHOOL STUDY TIME (OST) INDEX IN 1998



The students at the high level of the OST Index achieved a lower mean score in science than students at the other two levels. For mathematics, the pattern was similar. One possible explanation is that the students at the high level may have been lower ability students who required more time to complete their homework.

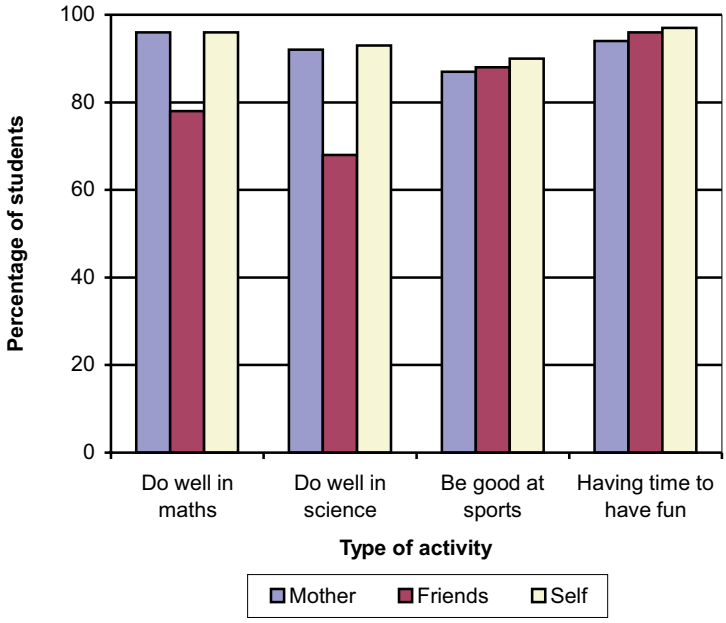
PERCEPTIONS AND ATTITUDES

This section focuses on Year 5 students' perceptions and attitudes towards home and school issues in general, and mathematics and science in particular. Positive attitudes and aspirations towards learning and school have been shown to play a crucial role in students' success in reading, mathematics and science (Caygill, 1993; and Martin, 1996a, 1996b & 1997).

Perceptions of the importance of 'doing well'

Students were asked to indicate whether or not they, their mothers, and their friends thought it important to do well in mathematics, to do well in science, to be good at sports, and to have time to have fun. Overall, the Year 5 students' 1998 responses were very similar to the responses from their 1994 counterparts. Figure 4.10 shows their results for 1998.

FIGURE 4.10 YEAR 5 STUDENTS' PERCEPTIONS OF THEIR MOTHERS' AND FRIENDS' VIEWS, AS WELL THEIR OWN, ON THE IMPORTANCE OF DOING WELL FOR 1998



Overall in 1998, the students' values aligned with their perceptions of their mothers' values. Fewer students indicated that they thought their friends believed it was important to do well in mathematics and science. The results form a close match to the results in 1994. Doing well in mathematics was consistently rated as being more important than doing well in science, with regard to the student, mother and friends (see Table D.11 in Appendix D for details). The results across each ethnic grouping generally matched those shown in Figure 4.10 (see Table D.12 in Appendix D).

Students' attitudes towards mathematics

According to *Mathematics in the New Zealand Curriculum* (Ministry of Education 1992), developing positive attitudes towards mathematics is an integral part of mathematics education. For example, one of the stated aims of mathematics education is to: *develop in students the skills, concepts, understandings, and attitudes which will enable them to cope confidently with the mathematics of everyday life* (p.8). As well as examining student achievement as an outcome of mathematics education, TIMSS also considers students' attitudes to mathematics.

Using a four-point rating scale, Year 5 students were asked to indicate the degree to which they supported each of the following statements:

- I enjoy learning mathematics;
- Mathematics is boring;
- Mathematics is an easy subject.

As well, they were asked (again on a four-point scale):

- How much do you like mathematics?

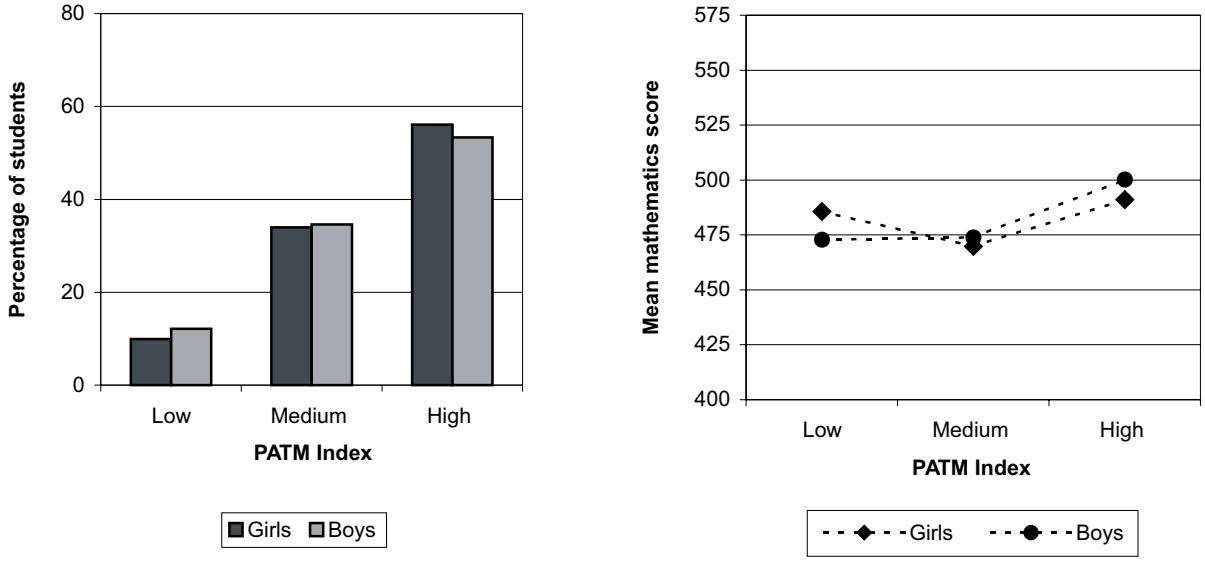
Year 5 students' responses to the above statements were combined to form the Positive Attitudes to Mathematics (PATM) Index (refer to Table D.13 in Appendix D for details on students' responses to

each statement/question for both years). Over half (55%) of Year 5 students were found to be at the high level of the PATM Index (ie, they held positive or very positive attitudes towards mathematics). About one-tenth (11%) of students were at the low level of the index (ie, they indicated negative or very negative attitudes towards mathematics). The remaining Year 5 students (34%) were at the medium level of the index (indicating they held mixed views).

A similar (but not identical) index was created for Year 9 students in 1998 (see Chamberlain & Walker, 2001). Notwithstanding the differences in the indices, it is interesting to note that Year 9 students were less likely to have positive attitudes towards mathematics than their counterparts at the middle primary level (34% compared with 55% respectively).

Figure 4.11 illustrates the proportions of Year 5 girls and boys at each level of the PATM Index, alongside their mean mathematics scores. There were similar proportions of each gender at each level of the index. The patterns of mean scores were also broadly similar, although girls classed as having medium attitudes towards mathematics achieved a lower mean score than girls with more negative attitudes towards the subject.

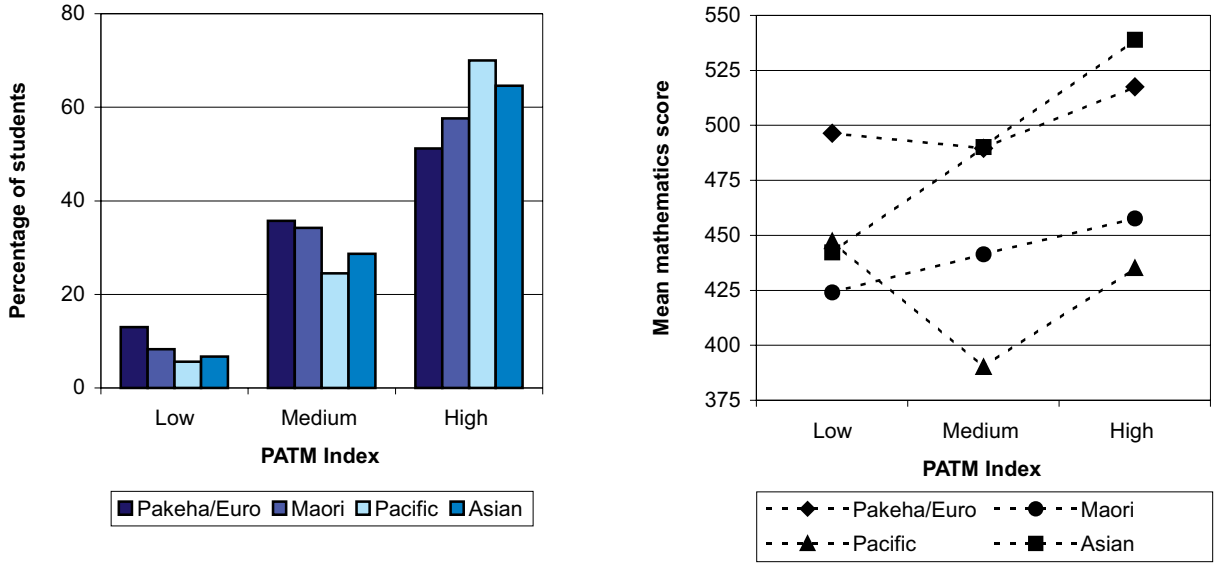
FIGURE 4.11 PROPORTION OF YEAR 5 STUDENTS ON THE POSITIVE ATTITUDES TOWARDS MATHEMATICS (PATM) INDEX AND THEIR MEAN MATHEMATICS SCORES FOR 1998, BY GENDER



The high level of the PATM Index denotes positive or very positive attitudes towards mathematics whereas the low level of the index denotes negative or very negative attitudes towards mathematics.

Figure 4.12 illustrates the proportions of Year 5 students in each ethnic grouping at each level of the PATM Index alongside their mean mathematics scores. It is important to note, however, the proportions in each main ethnic grouping at the low level of the index are very small, and therefore the information should be considered as indicative only (see Table D.14 in Appendix D for further details).

FIGURE 4.12 PROPORTION OF YEAR 5 STUDENTS ON THE POSITIVE ATTITUDES TO MATHEMATICS (PATM) INDEX AND THEIR MEAN MATHEMATICS SCORES FOR 1998, BY ETHNIC GROUPING



The high level of the PATM Index denotes positive or very positive attitudes towards mathematics whereas the low level of the index denotes negative or very negative attitudes towards mathematics.

The majority of students in each main ethnic grouping scored highly on the PATM Index. Pacific students had the highest proportion with positive attitudes towards mathematics (70%) followed by Asian (65%), Maori (58%), and Pakeha/European students (51%). Very few Year 5 students in any ethnic group scored low on the PATM index (between 6% and 13%). For each ethnic group except Pacific, a positive attitude towards mathematics was associated with a higher mean mathematics score.

Students' attitudes towards science

As with mathematics education, positive attitudes to science is an integral aspect of science education in New Zealand, particularly in terms of developing students' confidence and interest in order to encourage continued participation in scientific enquiry.

Using a four-point rating scale, Year 5 students were asked to indicate the degree to which they supported each of the following statements:

- I enjoy learning science;
- Science is boring;
- Science is an easy subject.

As well, they were asked (again on a four-point scale):

- How much do you like science?

As for mathematics, Year 5 students' responses to above statements were combined to form an index — the Positive Attitudes to Science (PATS) Index (refer to Table D.15 in Appendix D for details on students' responses to individual statements.)

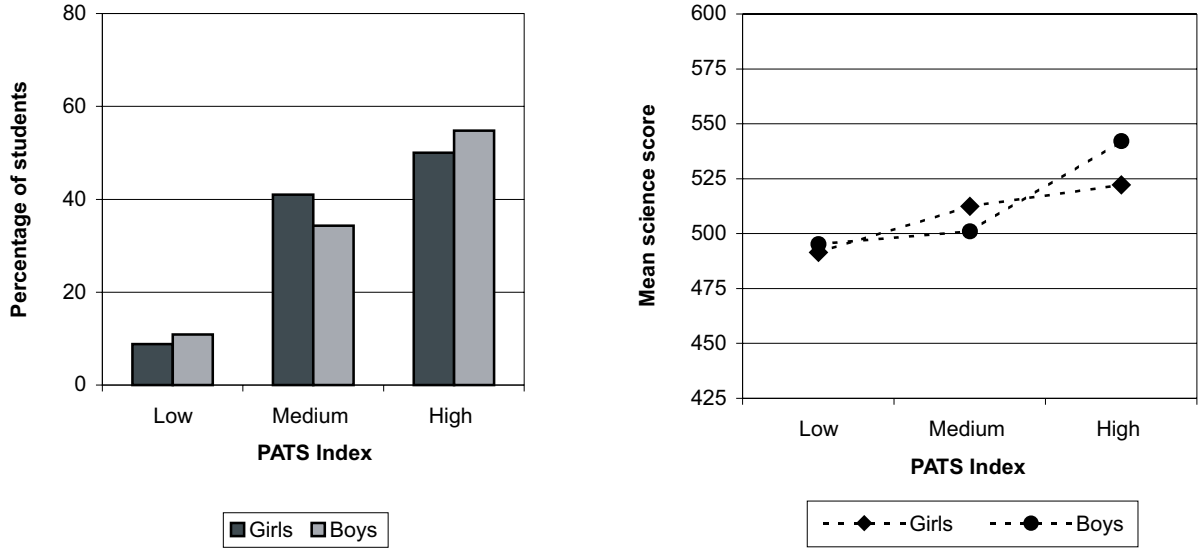
Just over half (52%) of Year 5 students were found to be at the high level of the PATS Index (ie, they held positive or very positive attitudes towards science). Approximately one-tenth of students were at

the low level of the index (ie, they reported negative or very negative attitudes towards science). The remaining Year 5 students (38%) were at the medium level of the index (indicating they held mixed views).

A similar index was created for Year 9 students in 1998 (see Chamberlain & Walker, 2001). While there are differences between the Year 9 and Year 5 indices, it is interesting that Year 9 students appear less likely to have positive attitudes towards science than their counterparts in Year 5 (28% compared with 52% respectively).

Figure 4.13 presents the proportions of Year 5 girls and boys at each level of the index along with their mean science scores. Note the similarities of the overall proportions and pattern of mean scores.

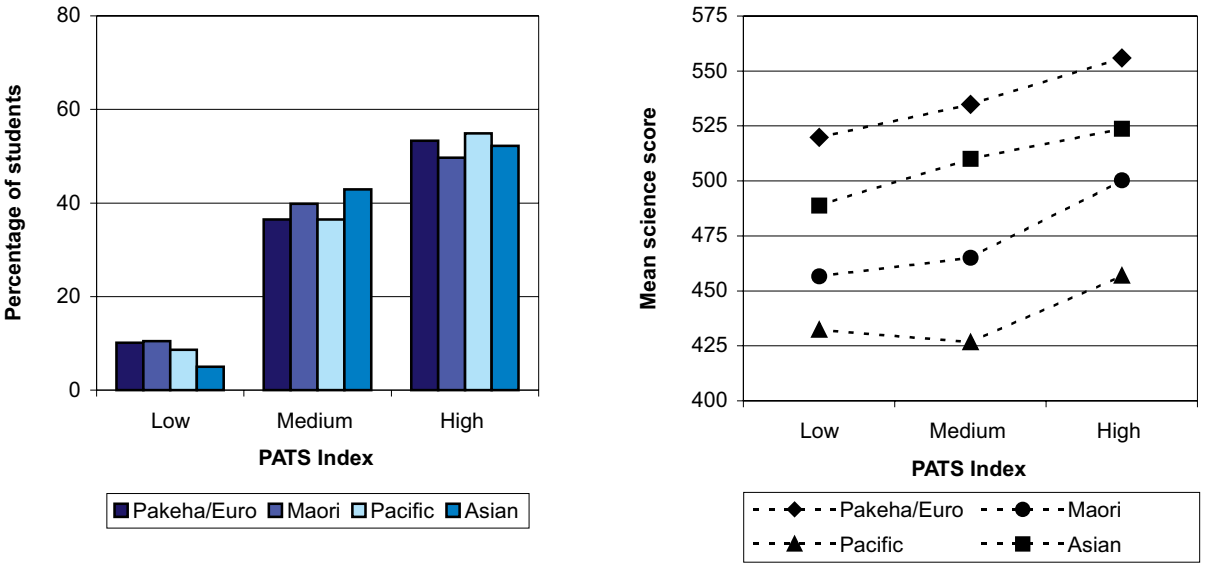
FIGURE 4.13 PROPORTION OF YEAR 5 STUDENTS ON THE POSITIVE ATTITUDES TOWARDS SCIENCE (PATS) INDEX AND THEIR MEAN MATHEMATICS SCORES IN 1998, BY GENDER



The high level of the PATS Index denotes positive or very positive attitudes towards science whereas the low level of the index denotes negative or very negative attitudes towards science.

Figure 4.14 illustrates the proportions of Year 5 students in each ethnic grouping at each level of the PATS Index alongside their mean science scores. It is important to note, however, that the proportions in each main ethnic grouping at the low level of the PATS Index are very small and therefore the information should be considered as indicative only (see Table D.16 in Appendix D for further details).

FIGURE 4.14 PROPORTION OF YEAR 5 STUDENTS ON THE POSITIVE ATTITUDES TO SCIENCE (PATS) INDEX AND THEIR MEAN SCIENCE SCORES FOR 1998, BY ETHNIC GROUPING



The high level of the PATS Index denotes positive or very positive attitudes towards science whereas the low level of the index denotes negative or very negative attitudes towards science.

Approximately half (between 50% and 55%) of the students from each ethnic group scored highly on the PATS Index, indicating positive or very positive attitudes to science. In contrast, only about 10 percent of students scored low on the PATS index across three of the main ethnic groupings, the exception being Asian students where only five percent reported negative attitudes towards science.

Perceived reasons for success in mathematics and science

Year 5 students were asked to indicate (on a four-point scale) the degree to which they considered a variety of factors as leading to success in mathematics and science. Student responses in 1998 are reported in Table 4.9 (see Table D.17 in Appendix D for the 1994 data).

TABLE 4.9 PROPORTION OF YEAR 5 STUDENTS' LEVEL OF AGREEMENT WITH REASONS FOR SUCCESS IN MATHEMATICS AND SCIENCE FOR 1998

Reasons for success	Mathematics				Science			
	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)
Lots of natural ability	37	46	13	4	41	44	13	3
Good luck	29	28	24	19	31	28	24	18
Lots of hard work studying at home	54	35	8	3	57	33	8	3
To memorise the textbook or notes	29	44	19	9	32	42	17	9

Natural ability

In 1998, more than four-fifths of students either strongly agreed or agreed that natural ability was a reason for success in both mathematics and science. These proportions were virtually unchanged from those observed in 1994. The 1998 results showed that there was little variation across the different ethnic groupings in response to this question for either mathematics or science — ranging in both subjects from 82 to 87 percent. There was little change in the comparable results for mathematics and science from 1994 by ethnicity.

Good luck

There was a seven percentage point decrease (from 66% to 59%) between 1994 and 1998 in the proportion of Year 5 students agreeing that good luck was a reason for success in science. There was a similar sized decrease for mathematics (from 64% to 57%). This is a good sign, perhaps indicating a growing awareness among primary school children that luck plays a minor role in the classroom.

In 1998, about 70 percent of Pacific and Maori students thought that good luck was important in doing well in mathematics, whereas the proportions of Asian and Pakeha/European students that held this view were 58 and 50 percent respectively. The proportions by ethnic grouping were very similar for the same question regarding science. It is notable that Maori and Pacific are markedly more likely to attribute success in mathematics and science to good luck, particularly since they did not perform as well, on average, as Asian or Pakeha/European students.

There were relatively small decreases (from 3 to 7 percentage points) in the proportions of students in three out of the four main ethnic groupings over the four-year period that endorsed good luck as a reason for success in mathematics. Over the same period there was virtually no change in the proportion of Asian students indicating this. All ethnic groupings reported a decrease in support of good luck as a reason for success in science since 1994 — ranging from 12 percentage points for Asian to four percentage points for Maori students.

Studying at home

Approximately 90 percent of students agreed that 'hard work studying at home' was important for success in each of mathematics and science in 1998, a small increase since 1994. The proportion of students in each ethnic grouping agreeing with the statement in 1998 was very similar for both mathematics (from 87% to 90%) and science (from 89% to 92%).

Memorising textbook or notes

Approximately three-quarters of Year 5 students in 1998 rated 'memorising the textbook or notes' as being important for success in each of mathematics and science. There was little difference between the overall proportions reporting this in 1994.

Examining responses by ethnic grouping, the biggest change that occurred since 1994 was the increase in the proportion of Pacific students indicating agreement with this statement, for mathematics only (from 70% in 1994 to 82% in 1998). There was a similar increase for Asian students (from 74% in 1994 to 82% in 1998) who agreed memorising was important for science.

SCHOOL ENVIRONMENT

This final section briefly summarises Year 5 students' perceptions and experiences of negative social elements of the school context. Students were asked to indicate whether or not during the last month they, or their friends, had something stolen by another student or thought another student would hurt them. As Table 4.10 shows there was little change between 1994 and 1998 in the overall proportions of students responding that these negative experiences had occurred.

TABLE 4.10 PROPORTION OF YEAR 5 STUDENTS REPORTING PARTICULAR EVENTS OCCURRING TO THEMSELVES OR THEIR FRIENDS IN 1994 AND 1998

In the last month at school	Proportion of students reporting yes (%)	
	1994	1998
Something of mine was stolen	46	42
Some of my friends had things stolen	53	49
I thought another student might hurt me	36	39
Some of my friends were hurt by other students	56	54

Theft

Overall in 1998, 42 percent of students reported that something of theirs was stolen in the preceding month, and 49 percent of students indicated that their friends had things stolen. This represented a decrease of four percentage points for both questions since 1994.

In 1998, Maori Year 5 students were most likely to indicate that something of theirs was stolen (49%) and Pakeha/European students least likely (38%). The main area of change since 1994 was the decrease in theft reported by Pakeha/European and Maori (of 6 and 4 percentage points respectively). For more details refer to Table D.18 in Appendix D.

Bullying

In 1998, 39 percent of Year 5 students indicated that they "thought another student might hurt" them in the preceding month at school, virtually the same proportion as in 1994. It is important to bear in mind that the phrase "might hurt me" indicates a belief rather than an actual event. Moreover, as bullying can be non-physical, it is unclear whether students responded with this in mind when they were considering "hurt me".

There continued to be differences among ethnic groupings in responding to this question. For example, in 1998, approximately 40 percent of Pakeha/European, Maori, and Pacific students reported they thought they might be hurt by other students in the preceding month at school, compared with about

one-third of Asian students. There were small increases between 1994 and 1998 in the proportion of students in three of four ethnic groupings reporting this — Pakeha/European, Asian and Pacific (3, 6 and 8 percentage point increases respectively). There was no change in the proportion of Maori students reporting this feeling between 1994 and 1998. See Table D.19 in Appendix D for details.

There were no statistically significant differences in the mean mathematics or science scores between those students who thought they might be hurt at school in the last month and those who did not. For more details refer to Table D.20 in Appendix D.