

Although national monitoring has been designed primarily to present an overall national picture of student achievement, there is some provision for reporting on performance differences among subgroups of the sample. Nine demographic variables are available for creating subgroups, with students divided into two or three subgroups on each variable, as detailed in Chapter 1 (p4).

The analyses of the relative performance of subgroups used an overall score for each task, created by adding scores for the most important components of the task.

Where only two subgroups were compared, differences in task performance between the two subgroups were checked for statistical significance using t-tests. Where three subgroups were compared, one way analysis of variance was used to check for statistically significant differences among the three subgroups.

Because the number of students included in each analysis was quite large (approximately 450), the statistical tests were quite sensitive to small differences. To reduce the likelihood of attention being drawn to unimportant differences, the critical level for statistical significance was set at $p = .01$ (so that differences this large or larger among the subgroups would not be expected by chance in more than one percent of cases). For team tasks, the critical level was raised to $p = .05$, because of the smaller sample size (120 teams, rather than about 450 students).

For the first four of the nine demographic variables, statistically significant differences among the subgroups were found for less than twenty percent of the tasks at both year 4 and year 8. For the remaining five variables, relating to student gender, student ethnicity, school socio-economic status (decile rating) and school ethnic mix, statistically significant differences were found on a substantial proportion of tasks at one or both levels. In the report below, all “differences” mentioned are statistically significant differences (to save space, the words “statistically significant” are omitted).

School Type

Results were compared for year 8 students attending full primary and intermediate schools. A difference was found on just two of the 54 tasks. Students attending intermediate schools scored higher on *Wheel Race* (p40) and *Link Task 20* (p51). On the *Year 8 Science Survey* (p64), students from intermediate schools expressed less enjoyment of doing science at school (question 1), but reported greater use of science equipment at school (question 5f).

School Size

Results were compared from students in larger, medium sized, and small schools (exact definitions were given in Chapter 1).

For year 4 students, there was a difference among the subgroups on 3 of the 56 tasks. Students from large schools scored lowest on *Kai Moana* (p19), while students from medium sized schools scored lowest on *Link Task 13* (p42) and *Link Task 14* (p42). There were no differences on the questions of the *Year 4 Science Survey* (p63).

For year 8 students, there was no difference on any of the 54 tasks. There were, however, differences on two questions of the *Year 8 Science Survey* (p64). Compared to other students, the students attending large schools reported that their classes more frequently performed science experiments both with everyday objects (question 5e) and with science equipment (question 5f).

Community Size

Results were compared for students living in communities containing over 100,000 people (main centres), communities containing 10,000 to 100,000 people (provincial cities), and communities containing less than 10,000 people (rural areas).

For year 4 students, there was a difference among the three subgroups on two of the 56 tasks. Students from rural areas scored highest on both *Kai Moana* (p19) and *Travelling Trucks* (p37). There was also one difference on the *Year 4 Science Survey* (p63), with students from rural areas most enthusiastic and students from main centres least enthusiastic to keep learning science (question 9).

For year 8 students, there were differences on nine of the 54 tasks. Students from main centres scored low on both *Link Task 5* (p24) and *Chemical Muddle* (p47). Students from rural areas scored low on *Sugar Solutions* (p48). Students from provincial towns and cities scored high on *Growing in the Mighty Forest* (p16), *Birds* (p20), *Link Task 2* (p23), *How Does it Work* (p27), *Link Task 12* (p41), and *Rocks* (p57). There were also differences on four questions of the *Year 8 Science Survey* (p64). Compared to other students, the students from rural areas reported that they less frequently performed science experiments at school with everyday objects (question 5e) or with science equipment (question 5f), less frequently entered science competitions (question 5g), and were less enthusiastic to keep learning about science (question 9).

Zone

Results achieved by students from Auckland, the rest of the North Island, and the South Island were compared.

For year 4 students, there were no differences among the three subgroups on any of the 56 tasks, or on the questions of the *Year 4 Science Survey*.

For year 8 students, there were differences among the three subgroups on eight of the 54 tasks. Students from Auckland scored low on seven tasks: *Finger Games* (p15), *Growing in the Mighty Forest* (p16), and *Flounder* (p17), *Link Task 5* (p24), *How Does it Work?* (p27), *Link Task 17* (p51), and *Rocks* (p57). Most of these involved knowledge of nature. Students from provincial towns scored low on *Flowing Electricity* (p34). There were also differences on six questions of the *Year 8 Science Survey* (p64). Compared to other students, the South Island students expressed less enjoyment of doing science at school (question 1), reported that their classes less frequently did really good things in science (question 4), and were less inclined to keep learning about science (question 9). On the other hand, students from Auckland reported that their classes more often did really good things in science (question 4), experienced group work in science (question 5d), performed science experiments with everyday objects (question 5e), and were enthusiastic to keep learning about science (question 9).

Gender

Results achieved by male and female students were compared.

For year 4 students, there were differences between boys and girls on 14 of the 50 tasks. Boys scored higher than girls on all of these tasks, which were spread across chapters 3 to 6, but with six of those tasks relating to Planet Earth and Beyond. Because of the large number of tasks, they are not listed here. There were no differences between boys and girls on the questions of the *Year 4 Science Survey* (p63).

For year 8 students, there were differences between boys and girls on 13 of the 48 tasks. Boys scored higher than girls on all of these tasks, which were spread across chapters 3 to 6, with rather more in Chapter 4 (Physical World) and Chapter 6 (Planet Earth and Beyond). There were also differences on three questions of the *Year 8 Science Survey* (p64). Compared to girls, boys reported greater enjoyment of doing science at school (question 1), greater expertise at science (question 6), and greater involvement in doing good things in science in their own time (question 8).

Student Ethnicity

Results achieved by Māori and non-Māori students were compared.

For year 4 students, there were differences on 6 of the 50 tasks. In each case, non-Māori students scored higher than Māori students. The differences occurred on

Growing in the Mighty Forest (p16), *Link Task 2* (p23), *Link Task 9* (p41), *Link Task 10* (p41), *Sugar Solutions* (p48), and *Link Task 25* (p61). There was also one difference on the *Year 4 Science Survey* (p63), with Māori students judging that their class more frequently did really good things in science (question 4).

For year 8 students, there were differences between Māori and non-Māori students on 22 of the 48 tasks, spread fairly evenly across chapters 3 to 6. Non-Māori students scored higher on 21 of those tasks, but Māori students scored higher on *Kai Moana* (p19). There were also differences on two questions of the *Year 8 Science Survey* (p64). Compared to other students, Māori students reported less experience in conducting science experiments with everyday things at school (question 5e), and were less inclined to believe that they would make a good scientist in the future (question 10).

Proportion of Māori Students in Schools

Schools were categorised into three subgroups: schools with less than 10 percent Māori students, schools with 10 to 30 percent Māori students, and schools with more than 30 percent Māori students. Results were compared for students attending schools in these three categories.

For year 4 students, differences among the three subgroups were found on 22 of the 56 tasks, spread across chapters 3 to 6. In all cases, performance levels declined as the proportion of Māori students increased, with the largest differences usually between schools with low and medium proportions of Māori students. There were also differences on two questions of the *Year 4 Science Survey* (p63). Students attending schools with more than 30 percent Māori students enrolled reported that their classes more frequently did really good things in science (question 4). They were also more inclined to think that they would make good scientists when they grew up (question 10).

For year 8 students, differences among the three subgroups were found on 21 of the 54 tasks, again spread across chapters 3 to 6. In all cases, performance levels declined as the proportion of Māori students increased. There was also a difference on one question of the *Year 8 Science Survey* (p64). Compared to other students, students attending schools with less than ten percent Māori students enrolled reported fewer opportunities to engage in group work in science (question 5d).

Proportion of Pacific Island Students in Schools

Because most of the Pacific Island students are concentrated into relatively few schools, it was difficult to create sensible subgroups for schools with higher or lower percentages of Pacific Island students. Two subgroups were formed: students attending schools with up to 10 percent Pacific Island students, and students attending schools with more than 10 percent Pacific Island students. Results were compared for students in these two subgroups.

For year 4 students, differences between the two subgroups were found on 27 of the 56 tasks, spread across chapters 3 to 6. In each case, students attending schools with more than five percent of Pacific Island students scored lower. There were also differences on three questions of the *Year 4 Science Survey* (p63). Students attending schools with more than ten percent Pacific Island students enrolled reported that their classes more frequently did really good things in science (question 4), experienced field trips or work outside (question 5a), or visited science activities (question 5b).

For year 8 students, differences between the two subgroups were found on 24 of the 54 tasks, spread across chapters 3 to 6. In each case, students attending schools with more than ten percent of Pacific Island students scored lower. There were also differences on five questions of the *Year 8 Science Survey* (p64). Compared to other students, the students from schools with more than ten percent Pacific Island students were more positive about doing science at school (question

1), said they experienced more field trips or science work outside the classroom (question 5a) and more group work in science (question 5d), and were more positive about their science capabilities (question 6) and continuing to learn science (question 9).

Socio-Economic Index

Schools are categorised by the Ministry of Education based on census data for the census mesh blocks where children attending the schools live. The SES index takes into account household income levels, categories of employment, and the ethnic mix in the census mesh blocks. The SES index uses ten subdivisions, each containing ten percent of schools (deciles 1 to 10). For our purposes, the bottom three deciles (1-3) formed the low SES group, the middle four deciles (4-7) formed the medium SES group, and the top three deciles (8-10) formed the high SES group. Results were compared for students attending schools in each of these three SES groups.

For year 4 students, there were differences among the three subgroups on 30 of the 56 tasks. While students from high SES schools generally did better than students from medium SES school, these differences were usually smaller than the differences between students from low and medium SES schools. There were also differences on three questions of the *Year 4 Science Survey* (p63). Students attending low decile schools reported that their classes more frequently did really good things in science (question 4), experienced field trips or work outside (question 5a), or visited science activities (question 5b).

For year 8 students, there were differences among the three subgroups on 34 of the 54 tasks. While students from high SES schools generally did better than students from medium SES school, these differences were usually smaller than the differences between students from low and medium SES schools. There were also differences on two questions of the *Year 8 Science Survey* (p64). Compared to other students, students attending high decile schools judged that they learned more about science at school (question 2), and reported that their classes had more opportunities to perform science experiments with everyday objects (question 5e).

Summary

School type (full primary or intermediate), school size, community size and geographic zone did not seem to be important factors predicting achievement on the science tasks. The other five factors revealed more substantial differences. Boys performed better than girls on about 30 percent of the tasks at both year levels. Non-Māori students performed better than Māori students on just 12 percent of the tasks at year 4 level, but on 44 percent of the tasks at year 8 level (Māori students scored higher on one year 8 task). Students attending schools with high proportions of Māori students scored lower than students attending other schools on about 40 percent of the tasks at both year levels. Students attending schools with more than ten percent Pacific Island students scored lower than students at other schools on about 50 percent of the tasks at both year levels. Most notably, there were statistically significant differences in the performance of students from low, medium and high decile schools on 54 percent of the year 4 tasks and 63 percent of the year 8 tasks. Differences on the science surveys were too varied to be summarised concisely here.