NMSSA

Wānangatia te Putanga Tauira
National Monitoring Study
of Student Achievement

Technology
2016 – Key Findings

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TECHNOLOGY 2016 – KEY FINDINGS

Report 13

Wānangatia te Putanga Tauira

National Monitoring Study of Student Achievement

Technology 2016

Key Findings

Educational Assessment Research Unit
and
New Zealand Council for Educational Research

NMSSA Report 13

MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

UNIVERSITY of OTAGO
SAPERE AUDE
Te Whare Wānanga o Otāgo
NEW ZEALAND

NZCER
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Key reports for Technology 2016 – Key Findings
(all available online at http://nmssa.otago.ac.nz/reports/index.htm)

13: Technology 2016 – Key Findings
15: Technical Information 2016

NMSSA
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National Monitoring Study of Student Achievement

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National Monitoring Study of Student Achievement
Educational Assessment Research Unit, University of Otago, PO Box 56, Dunedin 9054, New Zealand
Tel: 64 3 479 8561 • Email: nmssa@otago.ac.nz

Contents

2016 Project Team	EARU	NZCER
Management Team	Sharon Young Alison Gilmore Lynette Jones Jane White	Charles Darr
Design/Statistics/ Psychometrics/Reporting	Alison Gilmore Albert Liau Mustafa Asil	Charles Darr Hilary Ferral Jess Mazengarb Linda Bonne
Curriculum/Assessment	Sharon Young Jane White Cheryl Pearson	Linda Bonne Basil Keane Rose Hipkins
Programme Support	Lynette Jones Linda Jenkins James Rae Pauline Algie Lee Baker	Jess Mazengarb
External Advisors	Jeffrey Smith – University of Otago Marama Pohatu – Te Rangatahi Ltd	

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- members of the reference groups: Technical, Māori, Pasifika and Special Education
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- the students who participated in the assessments and their parents, whānau and caregivers
- the teachers who administered the assessments to the students
- the teachers and senior initial teacher education students who undertook the marking
- the Ministry of Education Research Team and Steering Committee.

Executive Summary

Introduction

In 2016, the *National Monitoring Study of Student Achievement* (NMSSA) assessed student achievement at Year 4 and Year 8 in two areas of the *New Zealand Curriculum* (NZC) – technology and learning languages. This report presents the key findings for technology as a learning area. It is supported by a report of technical information related to different components of the study.

Technology

The NZC[1] defines the focus of technology to be for 'students to learn to be innovative developers of products and systems and discerning consumers who will make a difference in the world' (p. 17).

The technology learning area comprises three strands: Technological Practice (knowing how to plan for practice, develop a brief and evaluate a range of outcomes); Technological Knowledge (knowing what key concepts underpin technological development and outcomes) and Nature of Technology (knowing why technology is influenced by, and influences, historical, social, environmental and cultural events).

Technological literacy is at the heart of technology education and is developed by exposure to a wide range of relevant learning experiences. Technological literacy enables students to live with, critique and contribute to technological developments that shape their lives.

Study features

NMSSA used a two-step sampling procedure to select 100 schools at each year level and up to 27 students within each school. The nationally representative sample at each year level was made up of about 2,300 students (see Appendix 1, *Technical Information 2016* report).

A programme was designed to gain an understanding of achievement in technology using three data gathering components. Table 1 outlines the features of each component.

Table 1 Features of the NMSSA technology study components

Assessment programme in technology		
Component	**Strands and IP components***	**Assessment approach and students participating**
1. Technological Literacy (TELI)	Technological Practice (TP) • planning for practice • brief development • outcome development and evaluation Technological Knowledge (TK) • modelling • products • systems Nature of Technology (NT) • characteristics of technology • characteristics of technological outcomes	• group-administered tasks mainly presented by computer • completed by all Year 4 and Year 8 students (about 2,300 at each year level)
2. Student questionnaire	• attitudes to technology • opportunities to learn technology at school	• computer-based questionnaire • completed by all Year 4 and Year 8 students (about 2,300 at each year level)
3. Teacher and principal questionnaires	• teacher and principal views of technology instruction in their school • teacher confidence as technology educators • professional learning and development in technology • provision for teaching technology in the school	• paper-based questionnaires • completed by over 200 teachers and about 100 principals at each year level

* IP component = Indicator of Progression component

[1] Ministry of Education. (2007). *The New Zealand Curriculum.* Wellington: Learning Media.

The Technological Literacy (TELI) assessment, which assessed across the three technology strands: Technological Practice, Technological Knowledge and Nature of Technology, covered the components listed in the *Technology Indicators of Progression*[2]. Some aspects of the TP strand were not able to be asssessed in NMSSA given the extended developmental process required to fulfil some aspects of the strand. The relative weightings of the three strands in the TELI assessment was 22, 36 and 42 percent, respectively.

Achievement on the TELI assessment was reported on a measurement scale that covered both year levels. The scale was aligned to the levels of the NZC through curriculum alignment processes that defined minimum scale scores (cut-scores) associated with achieving, on balance, the achievement objectives that were able to be assessed at curriculum levels 2, 3 and 4. Alignment of an achievement scale to the NZC has not been attempted before in this learning area.

Other data were collected through questionnaires from students, teachers and principals.

Key findings about achievement in technology

Achievement on Technological Literacy (TELI)

Seventy-three percent of Year 4 students achieved above the minimum TELI score associated with achieving curriculum level 2 objectives. Fifty-three percent of Year 8 students achieved above the minimum score on the TELI scale associated with achieving curriculum level 4 objectives.

The average TELI scale score for Year 8 students was 38 units higher than Year 4 students. This difference indicates that students make about 10 scale score units of progress per year between Year 4 and 8.

There were significant differences in achievement by gender, ethnicity and school decile at both year levels.

The average TELI scale score for girls was about 6 units higher than boys at both year levels.

The average TELI scale score for Māori and Pasifika students, who were more likely than other students to attend mid and low decile schools, was 11 TELI units lower than non-Māori and about 14 TELI units lower than non-Pasifika students, respectively. These differences are roughly equivalent to the amount of progress associated with one year of instruction and one and a half years of instruction, respectively.

The average TELI scale score for students from low decile schools (deciles 1, 2 and 3) was 20 TELI units lower than high decile schools (deciles 8, 9 and 10) and about 14 TELI units lower than mid decile schools (deciles 4, 5, 6 and 7), respectively. The difference between high and low decile schools is roughly equivalent to the amount of progress associated with two years of instruction.

Achievement on technology strands

Overall, on the TELI assessment, the items representing each strand have very similar difficulties.

Learning and teaching in technology: attitudes, opportunites, resources

About the students

About 80 percent of NZ European and Māori students at both year levels reported that they always speak English at home, compared with about 60 percent of Pasifika students and about 40 percent of Asian students.

The amount of English spoken at home was related to achievement. At Year 4, the difference, on average, between students who always spoke English at home scored 10 TELI units higher than those who never did. At Year 8, the difference was 25 TELI units. These differences represent roughly the amount of progress associated with one year and two and a half years of instruction, respectively.

[2] http://technology.tki.org.nz/Technology-in-the-NZC/Indicators-of-progression

Students' attitudes to school and to technology

Overall, Year 4 students indicated that they liked school more than Year 8 students. About 80 percent of Year 4 students reported liking school heaps or quite a lot, compared with 70 percent of Year 8 students. Greater proportions of Pasifika and Māori students, and students in low decile schools, liked school heaps. This contrasts with greater proportions of NZ European students and students in mid and high decile schools liking school quite a lot.

There was a complex association between how much students liked school and achievement. Students who did not like school at all had, on average, the lowest level of achievement. However, students who liked school heaps had lower levels of achievement, on average, than students who liked school quite a lot.

Year 4 and Year 8 students were positive about technology with the majority of students' Attitude to Technology (ATT) scale scores being in the positive and very positive categories. Year 4 students who had very positive attitudes to technology scored higher on the TELI assessment than those who had negative attitudes. However, very few students had negative ATT scores.

Students' perspectives on learning opportunities and choices in technology

Overall, Year 8 students reported more frequent opportunities to learn technology at school than Year 4 students, with experiences related to technological practice being the most frequently experienced by students at both year levels. Teachers reported broadly similar opportunities to learn as students.

Year 8 students had different choices of technology that they could study. Just over 70 percent of students studied resistant materials (e.g. wood, metal) and food technology/biotechnology. About 50 percent studied textiles. Less than 30 percent took each of computer programming/robotics, electronics and media. There were no gender, ethnicity and school decile differences in the percentage of students taking each technology option.

Teachers' perspectives on teaching and learning in technology

Overall, teachers were positive about technology and being a technology educator with Year 8 teachers being more positive than Year 4 teachers.

The teaching of technology was generally integrated with other learning areas at Year 4 and taught as a separate subject at Year 8.

Year 8 students tended to learn technology for a greater number of hours over the year than Year 4 students did. About 36 percent of Year 4 students spent more than 20 hours learning technology compared with 65 percent of Year 8 students.

Technological Practice was taught for about half of the technology programmes at both year levels. The other half of the programmes were devoted almost equally to teaching Technological Knowledge and the Nature of Technology.

Teachers at both year levels used a number of instructional strategies to teach technology, with the most frequently used strategies being whole class activities and mixed ability group-based activities.

Teachers' perspectives on resources for teaching and learning in technology

Overall, Year 8 teachers indicated that they received more professional support for teaching technology than Year 4 teachers. They also rated the overall level of professional support they received more favourably than Year 4 teachers did with 6 percent of Year 4 and 33 percent of Year 8 teachers rating it as good or excellent, respectively.

The majority of teachers at both year levels were aware of 'Technology Online' on Te Kete Ipurangi (TKI)[3] website, used it occasionally, and found it easy to locate the resources they needed.

Fewer teachers were aware of the technology 'Indicators of Progression' for assessing students' work, with less than half of the Year 8 teachers using them occasionally.

[3] Te Kete Ipurangi (TKI) *https://www.tki.org.nz/*

Just under half of Year 8 teachers and a fifth of Year 4 teachers had had technology-focused PLD in the last two years.

The majority of Year 8 teachers reported having access to suitable spaces, plentiful materials and good quality equipment. While two thirds of Year 4 teachers reported having access to suitable spaces, the majority reported not having access to plentiful materials or good quality equipment.

Principals' perspective on teaching and learning in technology

About two thirds of Year 8 schools had a technology centre, and about half of those had their technology specialist teach students from other schools.

The classroom teacher was largely responsible for teaching technology at Year 4 and some had support from a specialist technology teacher. At Year 8, in the majority of schools, a specialist taught all areas of technology, except for media, either entirely or with support from the classroom teacher. A mix of specialist teachers and classroom teachers taught media.

The majority of principals reported that teachers are implementing strategies to meet the needs of diverse students, and teachers have appropriate pedagogical content knowledge to identify and respond effectively to the learning needs of students in technology.

Overall, Year 8 principals rated their school's provision for learning in technology more highly than Year 4 principals. About 90 percent of Year 8 principals and 60 percent of Year 4 principals rated it as good, very good or excellent.

Two thirds of Year 4 principals indicated that teachers in their school had either no access or little access to technology PLD. In contrast, nearly two thirds of Year 8 principals reported that access to PLD was moderate or extensive.

About 60 percent of Year 4 principals and 30 percent of Year 8 principals indicated that technology had not been a focus for development in the last five years.

Priority learner groups

The percentage of Year 4 and Year 8 students from priority learner groups achieving at curriculum levels 2 and 4 objectives, respectively, are summarised in Table 2.

Table 2 Percentage of Year 4 and Year 8 students from each priority learner group achieving at or above curriculum level 2 and level 4, respectively

	Percentage of students from each priority learner group		
Year level and curriculum level	**Māori students**	**Pasifika students**	**Students with special education needs**
Year 4, level 2 and above	57	51	57
Year 8, level 4 and above	34	26	21

At both year levels, the pattern of differences in achievement related to gender and school decile for Māori and Pasifika students was similar to the national sample.

The annualised progress for the national sample was similar for Māori and Pasifika students (10 TELI units) and a little lower for students with special education needs (7 TELI).

Overall, Māori, Pasifika and students with special education needs indicated similar levels of positive attitudes to technology as the national sample at both year levels.

The national average on the TELI assessment at each year level was used as a benchmark for comparison purposes. At each year level, lower percentages of students from the priority learner groups scored at or above the respective national averages than the national samples. The average TELI scale scores for students achieving above the benchmark score were lower for students from the priority learner groups compared with all students in the national sample.

1 Introduction to NMSSA

This chapter provides a broad overview of the purpose and features of national monitoring, introduces the focus of the study for 2016, and outlines the structure of the technology report.

1. Purpose and features of national monitoring

NMSSA is designed to assess student achievement at Year 4 and Year 8 in New Zealand English-medium state schools. The main purposes of NMSSA are to:

- provide a snapshot of student achievement against the NZC
- identify factors that are associated with achievement
- assess strengths and weaknesses across the curriculum
- measure change in student achievement over time
- provide high-quality, robust information for policy makers, curriculum planners and educators.

NMSSA has a particular focus on Māori students, Pasifika students and students with special education needs.

The study began in 2012 and has been carried out over a five-year cycle. During the first cycle, we are setting the baseline for measuring change in student achievement over time in subsequent cycles.

The study continues the monitoring undertaken by the National Education Monitoring Project (NEMP) between 1995 and 2010. It also complements information generated by international evaluation studies, such as the Trends in International Mathematics and Science Study (TIMSS), the Progress in International Reading Literacy Study (PIRLS) and the Programme for International Student Assessment (PISA).

In addition to designing and carrying out an assessment programme, NMSSA collects contextual information from students, teachers and principals to help understand the factors associated with students' achievement. This includes: students' attitudes to, and their opportunities to learn in, the specific learning area being investigated; teachers' confidence in teaching the specific learning area and the learning opportunities students are provided with in classroom programmes; teachers' and principals' views of the professional and curriculum support provided by the school and the provision in the school for the learning area.

Advisory panels of curriculum experts[4], reference groups for the priority learner groups (Māori, Pasifika and special education needs) and a technical reference group provide support for the project.

[4] The technology advisory panel comprised technology discipline experts, advisors, teacher educators and researchers as well as classroom teachers and representatives of the Ministry of Education.

2. The focus of the study for 2016

In 2016, the focus for the NMSSA study was technology and learning languages[5]. In technology, nationally representative samples[6] of about 2,300 students from 100 schools at each of Year 4 and Year 8 took part in a group-administered assessment, and a random subset of about 800 students took part in activity-based and interview assessments.

Experienced, specially trained classroom teachers conducted the assessments during Term 3 (July to September 2016).

Table A1.1 in the Appendix summarises the characteristics of the samples of students, teachers and principals from whom data were collected.

3. Structure of the technology report

This report provides the key findings from the 2016 NMSSA study of technology using the TELI assessment, descriptions of the contextual data (including the views of students, teachers and principals) and results for priority learner groups.

The report is set out in five chapters.

- Chapter 1 provides a broad overview of the NMSSA programme.
- Chapter 2 describes the development of the technology assessment and contextual data collection instruments. It also sets out the analytical and reporting approaches used to present the findings.
- Chapter 3 presents the findings for Year 4 and Year 8 student achievement in technology using the TELI assessment. It reports technology achievement against the technology curriculum, compares achievement between Year 4 and Year 8 students, and reports differences between subgroups of gender, ethnicity, school decile and type of school. It also presents the findings for the technology strands.
- Chapter 4 examines a range of the contextual factors that may be associated with student achievement in technology, drawing on information collected from students, teachers and principals.
- Chapter 5 summarises the key findings for priority learners: Māori students, Pasifika students, and students with special education needs.

The report also contains an appendix providing detailed tables of results. Other background and technical information is contained in the separate report *Technical Information 2016*.

[5] The findings for learning languages can be found in *NMSSA Report 12: Learning Languages 2016 – Key Findings.*

[6] Information about the sampling process and the achieved samples can be found in Appendix 1 of *NMSSA Report 15: Technical Information 2016.*

2 NMSSA Technology Assessment Programme

This chapter provides an overview of the NMSSA assessment programme for technology. It includes four parts.

- Part 1 outlines the technology learning area.
- Part 2 summarises students' previous technology achievement in New Zealand.
- Part 3 describes the 2016 NMSSA technology study programme.
- Part 4 provides information about how the findings are presented.

1. Technology learning and the New Zealand Curriculum

The aim of the 2016 NMSSA technology study was to assess and identify contextual factors associated with the achievement and progress of Year 4 and Year 8 students in technology as it is described in the *The New Zealand Curriculum* (NZC)[7].

The NZC notes that "… in technology students learn to be innovative developers of products and systems and discerning consumers who will make a difference in the world" (p. 17).

The technology learning area comprises three strands.

- Technological Practice (TP): knowing how to plan for practice, develop and evaluate a brief and outcomes
- Technological Knowledge (TK): knowing what key concepts underpin technological development and outcomes
- Nature of Technology (NT): knowing why technology is influenced by (and influences) historical, social, environmental and cultural events.

Technological literacy is at the heart of technology education and enables students to live with, critique and contribute to technological developments that shape their lives.

2. Student achievement in NEMP for aspects of technology

The National Education Monitoring Project (NEMP) was carried out by the University of Otago for the Ministry of Education and ran from 1995 to 2010. NEMP conducted monitoring in four-yearly intervals in aspects of technology from 1996 to 2008. NEMP had a particular focus on technological knowledge and understanding, technological capability, and technology and society.

In 2008[8], NEMP reported that Year 8 students overall performed substantially better than Year 4 students on all aspects of technology. In general, Year 8 students were particularly strong in providing details about the design of objects and providing explanations of their ideas, generating a design idea, and thinking broadly about societal issues and concerns related to technology. This was consistent with findings from previous assessment cycles (1996, 2000 and 2004)[9].

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7 Ministry of Education. (2007). *The New Zealand Curriculum.* Wellington: Learning Media.

8 Smith, J., Crooks, T, & Allan, R. (2008) *Aspects of Technology Assessment Results 2008*. NEMP Report 48. National Education Monitoring Project, Educational Assessment Research Unit, University of Otago, Dunedin.

9 Crooks, T, & Flockton, L. (2004) *Aspects of Technology Assessment Results 2004*. NEMP Report 33. National Education Monitoring Project, Educational Assessment Research Unit, University of Otago, Dunedin.

Crooks, T, & Flockton, L. (2000) Aspects of Technology Assessment Results 2000. NEMP Report 18. National Education Monitoring Project, Educational Assessment Research Unit, University of Otago, Dunedin.

NEMP reports noted that since 1996, there have been small fluctuations in technology achievement at Year 4, resulting in no change overall between 1996 and 2008. At Year 8, there was an initial increase in achievement between 1996 and 2000 in tasks requiring analysis and description of materials and processes, but thereafter there was no change.

The same reports noted that socio-economic factors (school decile) and ethnicity influenced student achievement throughout the period of 1996–2008. Pakeha and Māori differences in achievement were moderate, while Pakeha and Pasifika differences were large.

According to NEMP, technology, as a learning area, was very popular with students at both year levels, but more so at Year 8.

3. 2016 NMSSA assessment programme for technology

An advisory panel of technology experts met with the NMSSA project team in 2015 to consider the assessment of technology. The panel expressed a desire for technology to be assessed as Technological Literacy across the three technology strands, and achievement within each strand to be explored.

Components of the technology programme

Building on the discussion with the advisory panel, the NMSSA team developed three components for the NMSSA 2016 technology programme (see Table 2.1). The first component focused on assessing student achievement across the three strands. This assessment was called the Techological Literacy (TELI) assessment. The two remaining components focused on collecting contextual and attitudinal information about learning technology from students, teachers and principals through questionnaires.

Table 2.1 The three components of the 2016 NMSSA technology programme

Component	Strand and IP component	Assessment approach
1. Technological Literacy (TELI)	Technological Practice (TP) • planning for practice • brief development • outcome development and evaluation Technological Knowledge (TK) • modelling • products • systems Nature of Technology (NT) • characteristics of technology • characteristics of technological outcomes	• group-administered tasks mainly presented by computer • completed by all Year 4 and Year 8 students (about 2,300 at each year level)
2. Student questionnaire	• attitudes to technology • opportunities to learn technology at school	• computer-based questionnaires • completed by all Year 4 and Year 8 students (about 2,300 at each year level)
3. Teacher and principal questionnaires	• teacher and principal views of technology instruction in their school • teacher confidence as technology educators • professional learning and development in technology (PLD) • provision for teaching technology in the school	• paper-based questionnaires • completed by over 200 teachers and about 100 principals at each year level

* IP component = Indicator of Progression component

Component 1: Technological Literacy

Technological literacy is at the heart of technology education and enables students to live with, critique and contribute to technological developments that shape their lives. Learning about technological literacy is intergrated across the three strands of the technology learning area: TP, TK and NT.

Each strand contributes to the construct of technological literacy and comprises two or three components. Although the NZC describes these components as interrelated within a strand, and the strands as interrelated within the learning area, one intention of the NMSSA assessment of technology was to identify the relative achievement of students in each of the strands in addition to students' level of achievement in

techological literacy (across the strands). The technology assessment (TELI), therefore, consisted of a number of items focused specifically on individual components within strands situated in a range of common contexts for students at Year 4 and Year 8.

Table 2.2 is an extract from the NZC and describes the achievement objectives within each strand for the technology learning area at level 2 (the level that Year 4 students are expected to be achieving at) and level 4 (the level that Year 8 students are expected to be achieving at). This provided the conceptual foundation for developing technology assessment tasks and items.

Table 2.2 Level 2 and level 4 achievement objectives in technology by strand and LP component

Strand and component	Level 2: Students will:	Level 4: Students will:
Technology practice		
Planning for practice	Develop a plan that identifies the key stages and the resources required to complete an outcome.	Undertake planning that includes reviewing the effectiveness of past actions and resourcing, exploring implications for future actions and accessing of resources, and consideration of stakeholder feedback, to enable the development of an outcome.
Brief development	Explain the outcome they are developing and describe the attributes it should have, taking account of the need or opportunity and the resources available.	Justify the nature of an intended outcome in relation to the need or opportunity. Describe the key attributes identified in stakeholder feedback, which will inform the development of an outcome and its evaluation.
Outcome development and evaluation	Investigate a context to develop ideas for potential outcomes. Evaluate these against the identified attributes, select, and develop an outcome. Evaluate the outcome in terms of the need or opportunity.	Investigate a context to develop ideas for feasible outcomes. Undertake functional modelling that takes account of stakeholder feedback in order to select and develop the outcome that best addresses the key attributes. Incorporating stakeholder feedback, evaluate the outcome's fitness for purpose in terms of how well it addresses the need or opportunity.
Technological knowledge		
Technological modelling	Understand that functional models are used to explore, test, and evaluate design concepts for potential outcomes and that prototyping is used to test a technological outcome for fitness of purpose.	Understand how different forms of functional modelling are used to explore possibilities and to justify decision making and how prototyping can be used to justify refinement of technological outcomes.
Technological products	Understand that there is a relationship between a material used and its performance properties in a technological product.	Understand that materials can be formed, manipulated, and/or transformed to enhance the fitness for purpose of a technological product.
Technological systems	Understand that there are relationships between the inputs, controlled transformations, and outputs occurring within simple technological systems.	Understand how technological systems employ control to allow for the transformation of inputs to outputs.
Nature of technology		
Characteristics of technology	Understand that technology both reflects and changes society and the environment and increases people's capability.	Understand how technological development expands human possibilities and how technology draws on knowledge from a wide range of disciplines.
Characteristics of technological outcomes	Understand that technological outcomes are developed through technological practice and have related physical and functional natures.	Understand that technological outcomes can be interpreted in terms of how they might be used and by whom and that each has a proper function as well as possible alternative functions.

Technological Literacy was assessed with a group-administered assessment. The TELI assessment was presented mainly by computer to about 2,300 students at each year level as a group-administered assessment. It included a mixture of selected-response and short-response questions. Students wrote their answers to the open-ended and short-response questions in a booklet; the selected-response questions were answered directly onto the computer. Some tasks were activity based and required a hands-on manipulation of technology products and then responding to questions on paper. These tasks were completed by a subset of 800 students at each year level.

The TELI assessment contained a total of 17 tasks at Year 4 and 18 tasks at Year 8. Each task included a set of questions based on one theme or idea. Descriptive criteria were used to score each open-ended and short-response question. Questions were scored dichotomously (0 or 1) or using scales that ranged from 0 to 2 or 0 to 3. Table 2.3 shows the breakdown of the number of tasks, questions and score points for each strand in the TELI assessment. Some aspects of the technological practice strand relating to students making artefacts in authentic contexts could not be accommodated in the assessment.

Overall, the TELI assessment had a greater proportion of score points associated with the nature of technology strand (42 percent), than with the technological knowledge strand (36 percent), and the technological practice strand (22 percent).

Table A5.2 of the *Technical Information 2016* report sets out the component of each task by strand.

Table 2.3 Number of tasks, questions and weighting of score points in the TELI assessment, overall and by strand

Year level	Number of tasks	Number of questions (and score points) overall and by strand			
		Overall	Technological practice	Technological knowledge	Nature of technology
Year 4	17	43 (71)	9 (17)	14 (26)	20 (28)
Year 8	18	50 (82)	9 (17)	15 (28)	26 (37)
Average weighting*			22%	36%	42%

* using score points

The TELI tasks were developed by assessment development staff within the NMSSA project team and technology curriculum experts. All tasks were carefully reviewed, including a cultural sensitivity review, to make sure the tasks were appropriate for Year 4 and Year 8 students. The tasks were piloted in Dunedin schools before being used in a larger trial involving schools in Dunedin and Auckland.

For the main study at Year 4 and Year 8, the tasks were divided into four linked booklets with each student answering questions to five group-administered tasks and two activity-based tasks.

Teacher assessors were instructed on how to administer the assessments during a four-day training session prior to the main study.

Up to 27 students in each school were each provided with a laptop computer to complete one of the booklets in groups of up to five, supervised by a teacher assessor.

Student responses for two tasks were recorded directly to the computer. These responses were then translated to scores using software developed for scoring purposes. Teacher markers and final-year students from the University of Otago College of Education were employed to mark the remaining tasks. All markers were trained and quality assurance procedures, including double marking, were used to monitor and ensure consistency of marking. The inter-rater reliability (intra-class correlation coefficient) for 66 percent of the questions was 'excellent' (greater than 0.75) and for 34 percent, it was 'good' (between 0.60 and 0.74) (Cicchetti, 19943)[10].

[10] Cicchetti, D. V. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological assessment*, 6(4), 284. NMSSA used SPSS to calculate inter-marker reliability using one-way random effects model, absolute agreement, average-measures ICC.

Examples of the TELI assessment tasks

Two tasks from the TELI assessment are presented on the following pages. The main features of each task are shown (the curriculum strand/s and task stimulus material). For each item, the component of the item is identified along with the scoring guide and example responses.

Task: *Doofer*

In the task called *Doofer* students were shown a video clip that explains how an invention called a doofer and its special dispenser work. They were asked to follow a set of instructions to construct the doofer (Figure 2.1). The *Doofer* task contained four items. The first item required students to identify two good things about the doofer in terms of how it had been made (Figure 2.3). The second item required students to label the parts of the doofer dispenser (Figure 2.3). The third item asked students to explain how the parts worked together to make the dispenser work (Figure 2.4). The fourth item asked students to explain why a business might have a doofer dispenser (Figure 2.5).

Curriculum Strands: **Technological knowledge, Nature of technology**

The video clip shows how an invention called a doofer and its special dispenser work.

Follow the instructions on your doofer to put it together.

Figure 2.1 Illustration of the *Doofer*

Item 1. What are two good things about the design of the doofer? Think about how it has been made.	
Component: **Identifies a technological product and describes relationships between the physical and functional attributes**	
Scoring category	**Example responses**
0: Inappropriate response or student is unable to respond	"It holds a burger." "It's made to hold food."
1: General statement/observations. Describes the doofer but with no link to design	"It's fun to use." "It's easy to make." "Juices don't fall out." "It's made out of cardboard."
2: Describes properties and how they related to the design choices.	"It's made from recycled sustainable materials." "It is a net which means it can be stored flat." "The curved shape means it fits the shape of a burger."

Figure 2.2 Item 1 of the TELI task *Doofer*

Item 2. The doofer dispenser is a machine that enables the customer to get a doofer. On the photo of the doofer dispenser label its parts.	
Component: **Identifies the components of a technological system and how they are connected**	
Scoring category	**Example responses**
0: Inappropriate response or unable to respond	"Magnet."
1: Identifies parts – includes the handle and suction/sticky cup	

Figure 2.3 Item 2 of the TELI task *Doofer*

Item 3. Explain how the dispenser parts work together so a customer can get a doofer	
Component: **Identifies the role each component has in allowing the inputs to be transformed into outputs within simple technological systems**	
Scoring category	**Example responses**
0: Inappropriate response or unable to respond	"Push." "Get a doofer."
1: General description of function	"Push the handle down and take a doofer." "Suction cup grabs doofer." "Lift handle to get a doofer."
2: Deeper description describing how all 3 actions effect the transformation	"Handle is pushed down so suction cup makes contact with one doofer and it is released from the pile; then the handle is pulled up with the doofer attached."

Figure 2.4 Item 3 of the TELI task *Doofer*

Item 4. Why might *Burger Fuel* (the burger restaurant) have a dispenser for their doofers?	
Component: **Describes possible users and functions of a technological outcome based on clues provided by its physical attributes**	
Scoring category	**Example responses**
0: Inappropriate response or unable to respond	"To help." "To get a doofer."
1: Simple reasoning	"To make it fun." "To keep it clean." "For easy storage." "To get one if they want it."
2: Deeper reasoning that describes need	"To have something other burger outlets don't have." "To be seen to be environmentally friendly by not giving every customer a doofer." "So people wouldn't take many – only one at a time." "To save staff costs in handling or constructing doofers."

Figure 2.5 Item 4 of the TELI task *Doofer*

Task: *School Sunhat*

In the task called *School Sunhat* students were told to imagine they have been asked to design a new sunhat for the students at their school. Their school wants the sunhat to provide protection from the sun, stay on and be comfortable to wear. The *School Sunhat* task contained two items. The first item required students to sketch and explain how the sunhat met the design brief (Figure 2.6). The second item required students to explain how using a computer might help a person when they design a sunhat (Figure 2.7).

Curriculum Strands: **Technological practice, Technological knowledge**

Draw a sketch of a new sunhat for your school. **Item 1. On your drawing write notes to explain how the sunhat:**	**a) Provides protection from the sun** **b) Stays on** **c) Is comfortable to wear**
Component:	**Describe design ideas (either through drawing models and/or verbally) for potential outcomes**
Scoring category	**Example responses**
0: No explanation about needs (a-c) outlined in the brief / Explains how design meets only one need outlined in brief / Inappropriate response	No labels on drawings
1: Explains how design meets two needs outlined in brief	"Padding for comfort." "SPF fabric to protect from the sun." "Velcro or hat in many sizes to stay on."
2: Explains how design meets all three needs outlined in brief	All of the above

Figure 2.6 Item 1 of the TELI task *School Sunhat*

Item 2. How might using a computer help a person when they design a sunhat?	
Component:	**Identifies the benefits and limitations of funtional modelling undertaken in particular examples**
Scoring category	**Example responses**
0: Inappropriate response	"It is easier." "You don't need to sketch." "You can use an app/program."
1: General description	"Can change colours/size." "Quick to design." "Can see what design works best."
2: Detailed, specific description	"Shows finished product in detail." "3D – so can see it from many angles." "Made to scale – accurate measurements." "Use an app to simulate sun." "You don't waste materials."

Figure 2.7 Item 2 of the TELI task *School Sunhat*

Scale construction and reliability

After students had completed the TELI assessment in the 2016 study, an Item Response Theory (IRT) approach[11] was used to construct a measurement scale for the TELI assessment. This approach included analysing the items used in the assessment for any bias with respect to year level, gender and ethnicity. The techniques used to do the scaling were similar to those used in studies such as PISA and TIMSS.

Standardising the scale

For ease of understanding, the scale was standardised so that:

- the mean of all students (Year 4 and Year 8 combined) was equal to 100 scale score units
- the average standard deviation for the two year levels was equal to 20 scale score units.

Achievement on the scale ranged from about 20 to 180 scale score units.

For the TELI scale, the person reliability index was 0.80.

TELI scale description

Figure 2.8 provides a description of the skills and knowledge measured by the TELI scale. The description was developed from the data collected with the technology assessment tasks in the NMSSA study held in Term 3, 2016.

To create the scale description, the scoring categories for each item (e.g. 0, 1 or 2) in the TELI assessment were located on the scale. This meant identifying where the students who scored in each category were most likely to have achieved overall on the scale. For example, the scoring category '1' for item 1 of the task *Doofer* (shown in Figure 2.2) was located at the part of the scale where students who scored a '1' on that item were most likely to have achieved overall. Once this had been done for all items, the descriptors that defined each scoring category were examined. The NMSSA team identified the competencies expected as the scale locations associated with the different scoring categories increased, and students' responses became more sophisticated. The result was a three-part description, providing a broad indication of what students typically know and can do in each strand of technology when achieving at different places on the scale.

The description is provided to give readers a strong sense of how technology was assessed through the TELI assessment. Readers are encouraged to refer back to the description when considering the meaning of the TELI scale scores provided throughout the report. The scale descriptors have not been written to necessarily 'line up' with curriculum levels or achievement objectives. They are a direct reflection of what was assessed and how relatively hard or easy students found the content of the assessment.

[11] IRT is an approach to constructing and scoring assessments and surveys that measure mental competencies and attitudes. IRT seeks to establish a mathematical model to describe the relationship between people (in terms of their levels of ability or the strengths of their attitude) and the probability of observing a correct answer or a particular level of response to individual questions. IRT approaches provide flexible techniques for linking assessments made up of different questions to a common reporting scale. The common scale allows the performance of students to be compared regardless of which form of the assessment they were administered.

The IRT approach allows a set of plausible values to be generated for each student involved in the study. Plausible values take into account the imprecision associated with scores on an assessment, which can produce biased estimates of how much achievement varies across a population. Each set of plausible values represents the range of achievement levels a student might reasonably be expected to attain given their responses to the assessment items. Plausible values provide more accurate estimates of population and sub-group statistics, especially when the number of items answered by each student is relatively low.

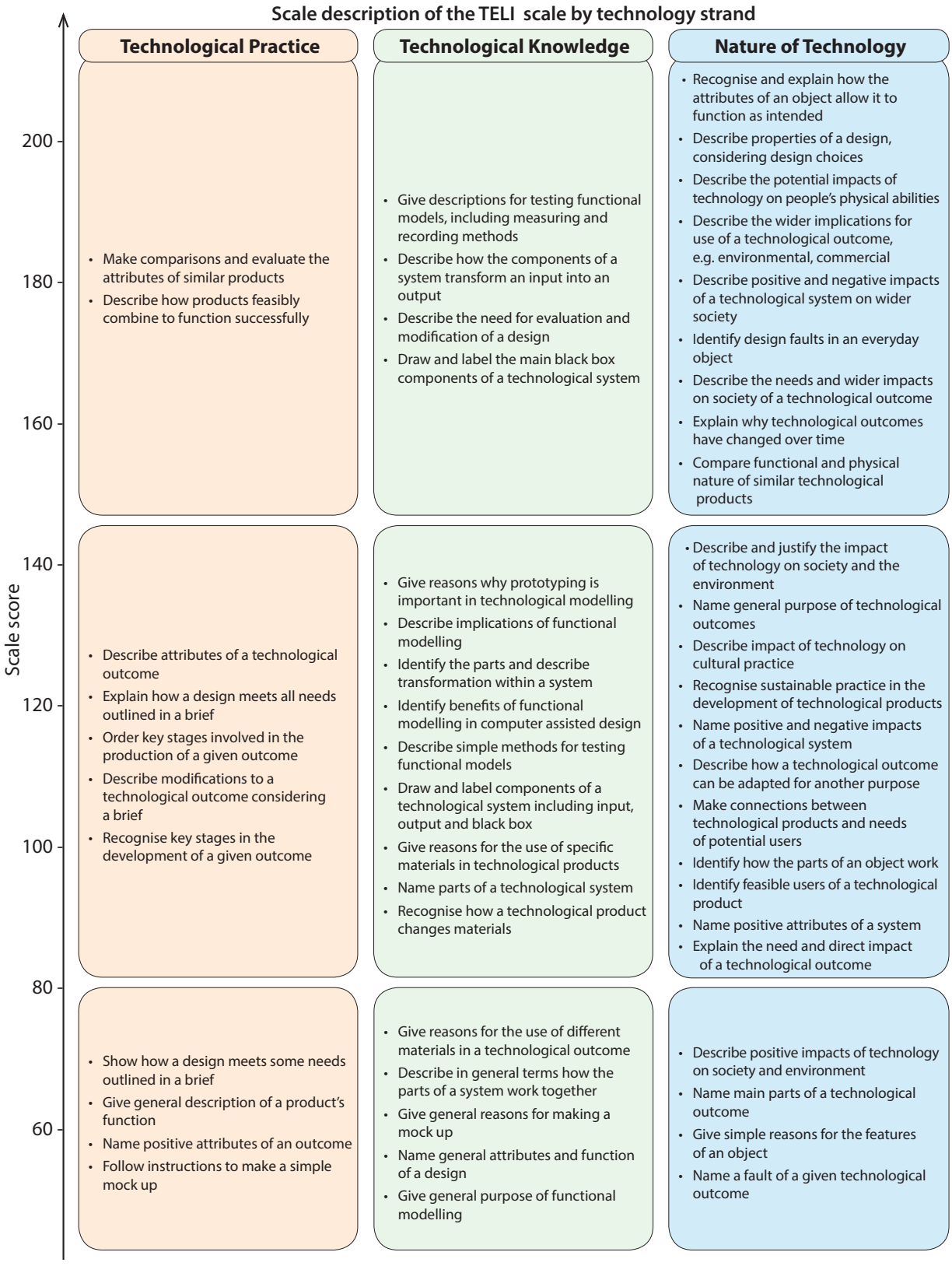


Figure 2.8 Description of the TELI scale

Reporting achievement in technology against curriculum levels

An alignment exercise was undertaken to link scale score ranges on the TELI to the levels of the NZC. A group of technology curriculum experts was invited to participate, as part of a panel, in the alignment exercise. The alignment exercise took the form of a day-long workshop. NMSSA researchers and psychometricians also formed part of the alignment team.

The team worked to define the minimum scale scores (cut-scores) that indicated that students were, on balance, achieving achievement objectives at each of curriculum levels 2, 3 and 4, respectively.

The panel was presented with detailed information to help them gain a thorough understanding of the assessment framework, and its relationship to the TELI scale. Questions and discussion were encouraged at all times. Considerable time was spent ensuring that the panel was equipped to make consistent and informed judgements about the relationship of the scale to the relevant curriculum levels.

The panel had the opportunity to experience assessments as students had experienced them in the NMSSA main study. Technology resources and exemplars used during the assessment were provided and assessment tasks were presented on laptops. The relative difficulty and cognitive demands of each item were examined and discussed. A detailed description of the procedure can be found in Appendix 3 of the *Technical Information 2016* report.

In the NZC, each of the first four curriculum levels has been designed to represent about two years of learning at school. The curriculum expectation is that students will have, on balance, achieved level 2 objectives by the end of Year 4; and, on balance, achieved level 4 objectives by the end of Year 8.

Component 2: Student perspectives on technology

The second component of the NMSSA technology programme involved a computer-based questionnaire for students. All students in the study responded to the questionnaire, which asked them to rate a series of statements about their attitudes to technology and to indicate how often they experienced a range of learning opportunities in technology. A measure of Attitude to Technology was constructed based on responses to the first set of statements.

Attitude scale construction and reliability

A draft version of the statements used to measure students' attitudes to technology was piloted with small groups of students before being used in the main study.

IRT was used to construct a reporting scale based on the responses to the attitude statements in the main study. The scale constructed was called Attitude to Technology (ATT). As with the other NMSSA scales, the ATT scale was set to have an average of 100 scale score units and an average standard deviation over the two year levels of 20 scale score units. For the ATT scale, the person reliability index was 0.72.

Component 3: Teacher and principal perspectives on technology

Separate questionnaires were developed for teachers and principals to ask about their perspectives on the learning and teaching of technology.

Up to three teachers from each school were asked to fill in a teacher questionnaire. In small schools there may have been fewer than three teachers available. The teachers chosen were those who had the most students participating in NMSSA assessment, and/or were specialist technology teachers. The questionnaire asked teachers about their preparedness and support to teach technology, opportunities for students to learn technology, and their own opportunities to undertake professional learning.

The principals' questionnaire asked principals about the school-wide programme in technology.

4. Presentation of the findings

This section describes how graphs and tables are used to present findings in the report, and includes an explanation of some of the statistics used.

Box plots

Box and whisker plots (box plots) are used extensively throughout this report to summarise score distributions.

To construct a box plot, scores are ordered from low to high and then divided into four groups of equal size, called quartile groups. These are shown in Figure 2.9.

The box is used to show the range of the middle 50 percent of the scores and the whiskers the top and bottom 25 percent of scores. In this report, the whiskers of the box plot do not include outliers (scores considered to be rare and unusual) and have a maximum length of 1.5 multiplied by the inter-quartile (middle 50 percent) range.

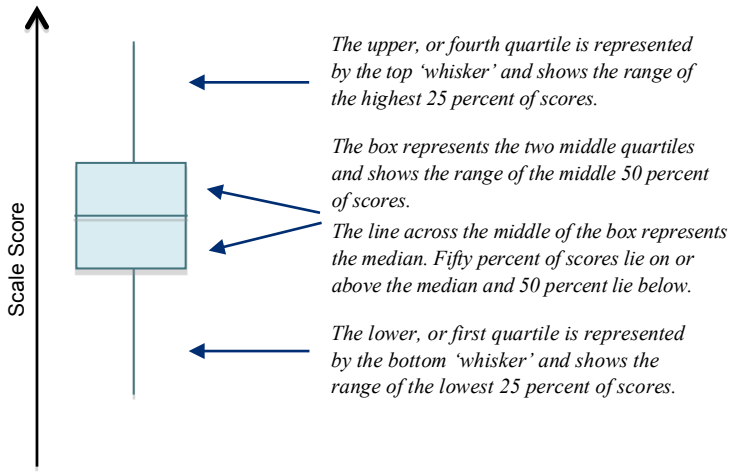


Figure 2.9 Understanding box plots

When box plots for two or more groups are presented as part of the same graphic, the widths of the boxes are used to represent the relative sizes of the groups. For instance, a narrow box indicates that the group size is smaller than that represented by a wider box in the same plot. Box plots have not been drawn when the size of the group falls below 30 students.

The colours for the box plots have been chosen to assist with readability. Different hues have been selected to represent each of the reporting groups (for instance, gender) and two different shades of each hue chosen to represent the group at each year level (a lighter shade for Year 4 and a darker shade for Year 8).

The intention behind the use of shades was to show the relationships between the year levels and the different reporting group types at the same time.

For plots involving the achievement scales, the minimum scale score associated with achieving the curriculum objectives at each of curriculum levels 2 to 4 are indicated by the grey horizontal dotted lines across the graph as shown in Figure 2.10.

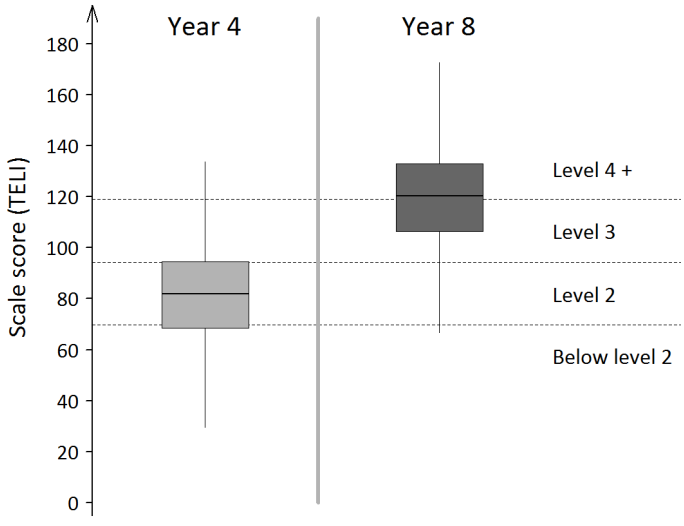


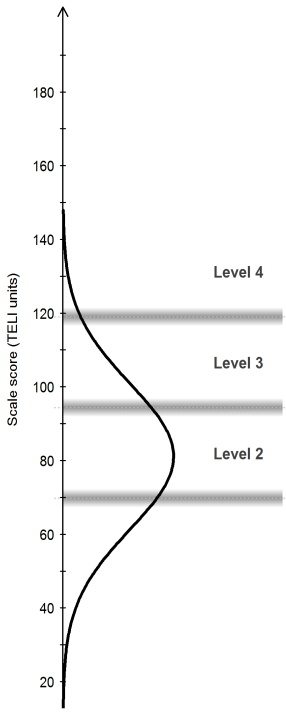
Figure 2.10 Understanding box plots with curriculum levels

Line graphs of score distributions

Another type of graph used to display data in this report is the line graph as shown in Figure 2.11. Line graphs are used to show how the distributions of scores for Year 4 and Year 8 compare with curriculum expectations. Horizontal shaded lines are used to indicate the 'cut-scores' used to separate achievement at one curriculum level from another. The shading around the lines provides a reminder that these lines represent the result of a judgement exercise (the curriculum alignment process).

Tables of numerical results

The TELI measure developed for the NMSSA technology study quantifies achievement differences in terms of scale score units. Because the same scale has been used at both Year 4 and Year 8 it is possible to estimate how much change, on average, occurs on an annual basis.



Horizontal shaded bars are placed on the line graphs to show how the scale aligns to the curriculum levels of the arts learning area. The width of these bars reflects the fact that the curriculum levels themselves and the alignment exercise cannot provide precise cut-off points, therefore their use as an approximate guide is more appropriate.

Figure 2.11 An example of a line graph

Table 2.4 shows the differences in average scale scores on the TELI scale between Year 4 and Year 8, and how this relates to annualised change. As can be seen, scores increased, on average, by about 10 scale score units per year. This figure is useful to keep in mind when interpreting scale score differences throughout the report.

Table 2.4 Difference between the average scale scores for Year 4 and Year 8 on the TELI assessment

	Technological literacy
Difference in average scale score (Year 8 – Year 4)	**38**
Confidence interval	(37.5, 39.5)
Average annual change	10
Average annual effect size	0.48

Table 2.4 also shows the 95 percent confidence interval associated with the difference in average scores at Year 4 and Year 8. Confidence intervals are used throughout the report and provide a range within which we can be fairly sure the population value for the reported statistic lies. The confidence intervals have been adjusted to account for any design effect created through the sampling procedure (i.e. sampling schools and then sampling students). As a general rule of thumb, when the confidence intervals for two groups do not overlap we can have some confidence that the difference in the statistic reported for the groups represents a real difference at the population level. In other words, the difference is not just the result of the kind of random variation that occurs in sampling studies. In this case we regard the difference as statistically significant.

In this report, any score differences between groups shown in tables are shown in bold font when their associated confidence intervals do not include zero. For instance, in Table 2.3, the Year 8–Year 4 difference of 38 scale score units is in bold font—the difference is considered to be statistically significant.

Effect sizes have been used to help interpret differences between groups. An effect size quantifies the difference between the average scores for two groups in terms of standard deviation units. The calculation of the effect sizes in this report weights the standard deviation for each group by its sample size. Because the standard deviations for groups are often different, this can mean that the same difference in scale score units results in slightly different effect sizes for different pairs of groups. When comparing two effect sizes, it is very important to refer back to the scale score differences to make sure any interpretations are valid.

The use of rounding

In the tables and text presented in this report, the average scores for each group and subgroup have been rounded to whole numbers. Some tables of findings report the difference between average scale scores for two groups or subgroups. These differences have been calculated using the non-rounded averages and are numerically correct. In some cases, the difference reported may not be the same as the simple difference between the pair of rounded averages shown in the table. All confidence intervals have been rounded to the nearest half scale score unit or percentage point.

3 Student Achievement in Technology

This chapter describes student achievement on the Technological Literacy (TELI) assessment. Variation in achievement on the TELI assessment is reported within and across year levels by gender, ethnicity, school decile and school type. Achievement in technology for the priority learner groups (Māori, Pasifika and students with special education needs) is reported in Chapter 5. Achievement on each technology strand: Technological Practice (TP), Technological Knowledge (TK) and Nature of Technology (NT) are contrasted by year level.

Detailed tables of means, standard deviations, sample sizes, effect sizes and 95 percent confidence intervals can be found in the appendix.

1. Technological Literacy assessment

Figure 3.1 shows the distributions of scores on the TELI scale for Year 4 and Year 8 students. Year 8 students generally scored higher than Year 4 students, although there was some overlap in the score distributions for Year 4 and Year 8.

Table 3.1 provides summary statistics from the TELI assessment for each year level. The average score for Year 8 students was higher than the average score for Year 4 by 38 TELI units with an associated effect size of 1.91. This year level difference in average scale scores represents an annualised difference of about 10 TELI units with an annualised effect size of 0.48.

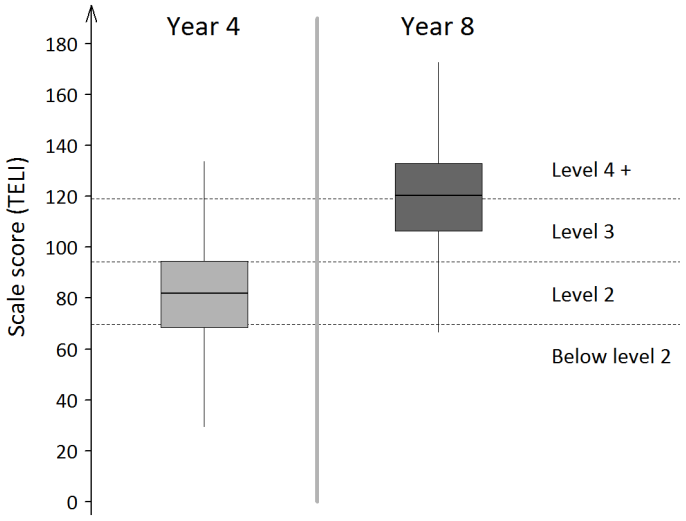


Figure 3.1 Distribution of scores on the TELI scale, by year level

We can use the 10 TELI units to represent the average amount of progress in achievement associated with about one year of instruction.

Table 3.1 Summary statistics for Year 4 and Year 8 students from the TELI assessment

	Year 4	Year 8	Difference between Year 8 and Year 4
	N = 2337	*N* = 2284	
Average scale score	81	119	**38**
Confidence interval	(80.0, 82.0)	(118.5, 120.5)	(37.0, 39.5)
Standard deviation	19	19	
Annualised Year 8–Year 4 difference			10
Annualised effect size			0.48

Achievement against the curriculum

Table 3.2 shows the percentages of Year 4 and Year 8 students achieving against curriculum levels according to the TELI scale. Seventy-three percent of Year 4 students scored above the minimum score on the TELI scale associated with achieving curriculum level 2 objectives. Fifty-three percent of Year 8 students scored above the minimum score associated with achieving curriculum level 4 objectives.

Table 3.2 Percentage of Year 4 and Year 8 students achieving across curriculum levels according to the TELI scale, by curriculum level

	Year 4		Year 8	
Curriculum level	%	Confidence interval (%)	%	Confidence interval (%)
Level 4 and above	2	(1.5, 2.5)	53	(50.0, 55.0)
Level 3	23	(21.5, 25.5)	36	(34.0, 38.5)
Level 2	48	(45.5, 50.5)	10	(8.5, 11.5)
Level 1	27	(24.5, 29.0)	1	(0.5, 1.5)

Figures 3.2 and 3.3 show the whole score distribution for Year 4 and Year 8, respectively, against the agreed alignment of curriculum levels 2, 3 and 4 with the TELI scale. The grey horizontal lines represent the cut-scores associated with curriculum levels 2, 3 and 4.

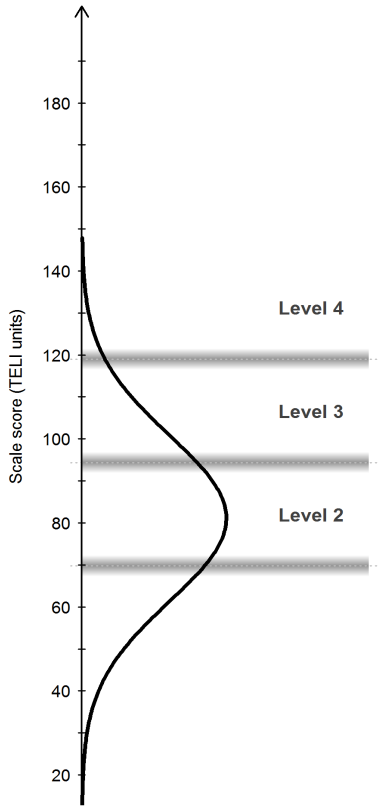


Figure 3.2 Distribution of scores for Year 4 students on the TELI scale against the NZC levels for technology

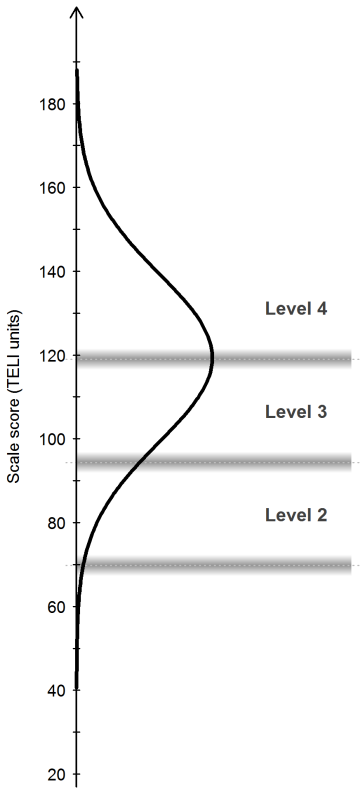


Figure 3.3 Distribution of scores for Year 8 students on the TELI scale against the NZC levels for technology

Table 3.3 shows the percentages of students achieving at or above their expected curriculum levels at each year level in all learning areas that NMSSA has assessed during Cycle 1. The percentage of Year 4 students who scored above the minimum score associated with achieving curriculum level 2 objectives in technology was about the same as for the arts. The percentage of Year 8 students who scored above the minimum score associated with achieving curriculum level 4 objectives in technology was about the same as for health and physical education. At both year levels, the percentage of students achieving against their respective curriculum levels ranks technology in the middle of all other learning areas.

Table 3.3 Percentage of Year 4 and Year 8 students who score above the minimum score associated with achieving curriculum level 2 and 4 objectives, respectively, by learning area

Learning area (year)	Year 4 (Curriculum level 2 and above)	Year 8 (Curriculum level 4 and above)
	%	%
English: Writing (2012)	65	35
Science (2012)	85*	19**
Mathematics (2013)	81	41
Health and Physical Education (2013)	97	51
English: Reading (2014)	58	59
Social Studies (2014)	63	38
English: Listening (2015)	79	70
English: Viewing (2015)	77	63
The Arts (2015)	72	63
Technology (2016)	73	53

Note: * = At developed levels 1 and 2, and above. ** = At developed levels 3 and 4, and above.

Achievement by student-level variables

Figures 3.4 and 3.5 display the score distributions on the TELI scale at Year 4 and Year 8, respectively, by gender and ethnicity[12].

Girls scored higher, on average, than boys by 6 TELI units at Year 4 and 7 TELI units at Year 8. The differences were statistically significant and equivalent to the amount of progess associated with about seven months of instruction.

Māori and Pasifika students, on average, scored lower than non-Māori and non-Pasifika students at both year levels. At Year 4, the differences were 11 and 14 TELI units, respectively. At Year 8, the differences were 11 and 15 TELI units, respectively. These differences were statistically significant and were equivalent to the amount of progress associated with about one year and one and a half years of instruction, respectively.

Differences in achievement associated with ethnicity have been found consistently across other learning areas of the NZC assessed by NMSSA.

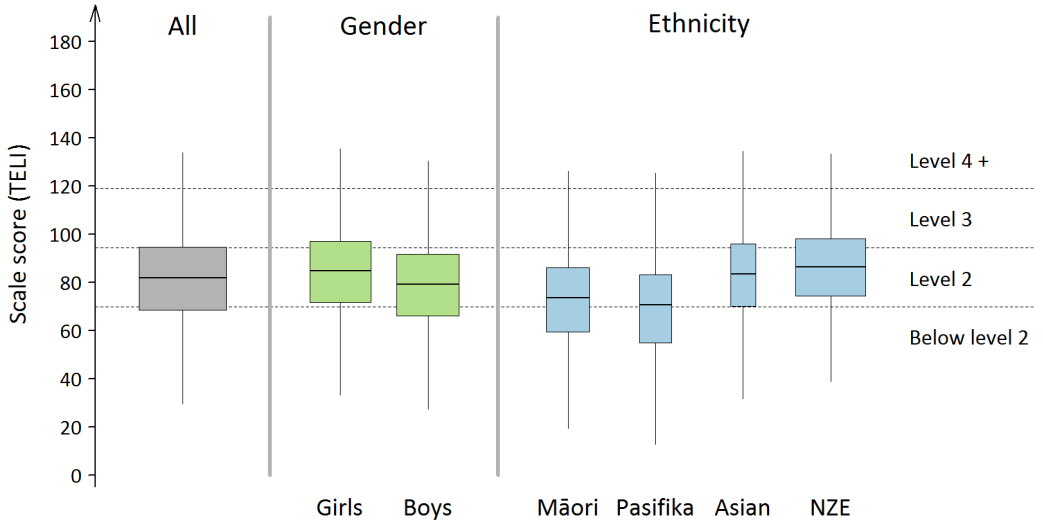


Figure 3.4 Distribution of scores for Year 4 students on the TELI scale, by gender and ethnicity (NZE=New Zealand European)

Figure 3.5 Distribution of scores for Year 8 students on the TELI scale, by gender and ethnicity (NZE=New Zealand European)

[12] Non-prioritised ethnicity was used where students could identify with up to three ethnicities. This meant they could be present in multiple ethnic groups. Student ethnicity data were obtained from National Student Number information held on the Ministry of Education ENROL database. The 'New Zealand European' category included New Zealand Pākehā only. The 'Pasifika' category included Tokelauan, Fijian, Niuean, Tongan, Cook Islands Māori, Samoan and other Pacific peoples. The 'Asian' category included Filipino, Cambodian, Vietnamese, Other Southeast Asian, Indian, Chinese, Sri Lankan, Japanese, Korean and other Asians. The 'Other' category included Australians, British/Irish, German, Dutch, Greek, Polish, South Slav, Italian and other Europeans, Middle Eastern, Latin American, African and Not Stated.

Achievement by school-level variables

Figures 3.6 and 3.7 show the performance of students according to school decile[13] and school type[14]. At both year levels, the average score for students from high decile schools was greater than the average scores for students from mid and low decile schools. The difference between the average scores for students in the high and low decile bands was 20 TELI units at both year levels (which is roughly equivalent to the amount of progress associated with two years of instruction). The difference between the average scale units for low and mid decile schools was 14–15 TELI units.

There were no statistically significant differences between the average scores for students at different school types at either year level. These decile and school type patterns have been found consistently across other learning areas of the NZC assessed by NMSSA.

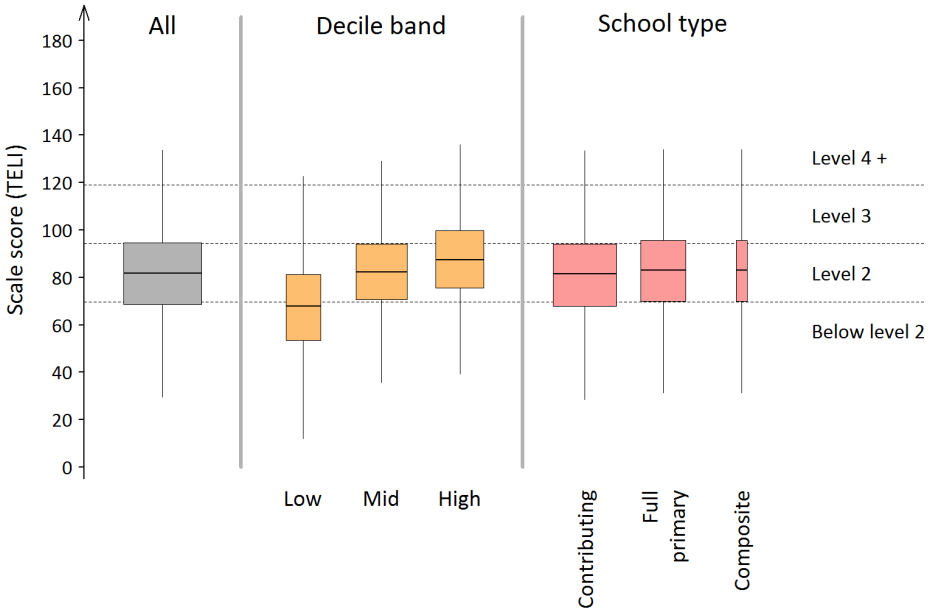


Figure 3.6 Distribution of scores for Year 4 students on the TELI scale, by decile band and school type

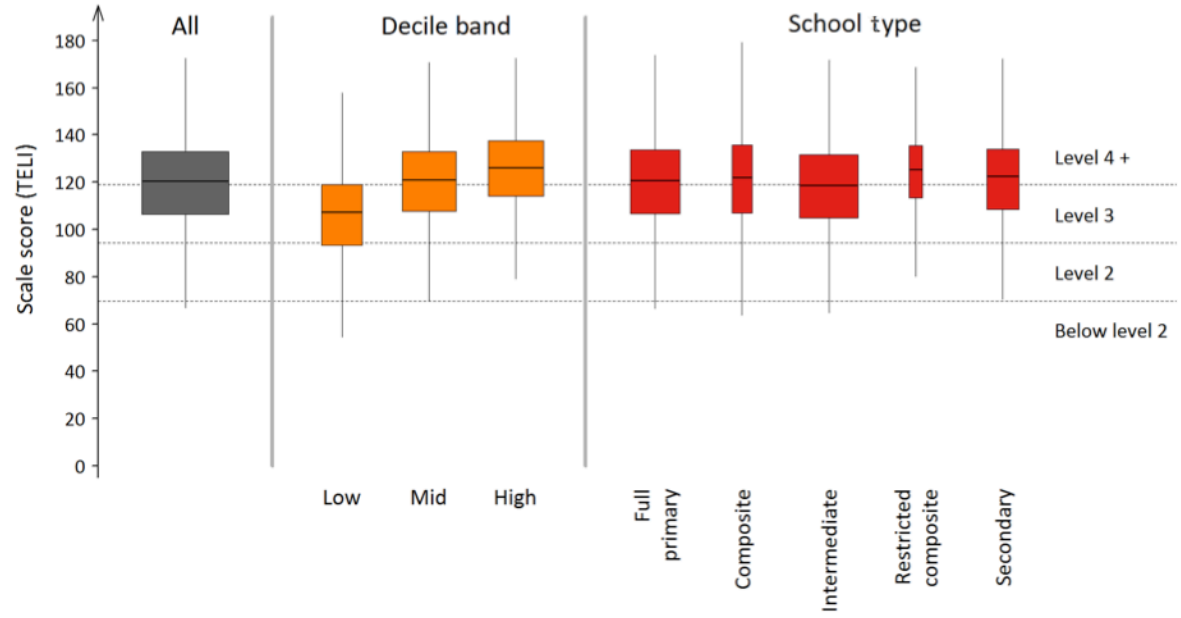


Figure 3.7 Distribution of scores for Year 8 students on the TELI scale, by decile band and school type

[13] The *low* decile band comprised students in decile 1 to decile 3 schools, the *mid* band comprised students in decile 4 to decile 7 schools, and the *high* band comprised students in decile 8 to decile 10 schools.

[14] A *composite* school combines students from different year levels that are typically found in separate primary or secondary schools. A *contributing* school caters for Years 1 to 6 of schooling. A *full primary* school caters for Years 1 to 8 of schooling. S*econdary* schools cater for Year 7 to Year 15 of schooling, although many cater for Year 9 to Year 15 only. An *intermediate* school caters for Years 7 and 8 of schooling. A *restricted composite* school caters for Years 7 to 10 of schooling.

Difference in achievement between Year 4 and Year 8

Table 3.4 shows the difference between the average TELI scale scores for Year 4 and Year 8 across a range of groups. In general, the differences across the groups were very similar to the difference in the average scores for all students. All subgroups showed the same or similar amounts of progress between Year 4 and Year 8 with annualised effect sizes ranging between .46 and .54.

Table 3.4 Difference in average scores on the TELI scale for Year 4 and Year 8, by subgroup

	Technological Literacy score (TELI units)					
	Year 4 average	Year 8 average	Year 8–Year 4 difference in averages	Confidence interval for the difference	Annualised difference in averages	Annualised effect size
Year						
All	81	119	**38**	(37.0, 39.5)	10	0.48
Gender						
Girls	84	123	**39**	(37.0, 40.5)	10	0.50
Boys	78	116	**38**	(35.5, 39.5)	10	0.47
Ethnicity						
Māori	72	111	**38**	(35.5, 41.0)	10	0.50
Pasifika	69	106	**37**	(33.0, 39.5)	9	0.46
Asian	82	121	**38**	(34.0, 42.5)	10	0.50
New Zealand European	86	124	**38**	(36.5, 39.5)	10	0.52
School decile						
Low	67	106	**39**	(36.0, 42.0)	10	0.49
Mid	82	120	**38**	(36.0, 40.0)	10	0.51
High	87	126	**38**	(36.5, 40.5)	10	0.54

2. Technological Practice, Technological Knowledge, Nature of Technology assessments

A view of student achievement on each strand of technology was gained by examining the item map for the TELI assessment by strand. The item map locates each item on the scale according to its relative difficulty. Items located higher on the scale are relatively more difficult than those located lower on the scale. Each item within each strand is represented by a different coloured dot. The map is presented in Figure 3.8. As can be seen, on average, the items representing each strand have very similar difficulties. The TP strand includes two outlier items, which enhance the impression of difference.

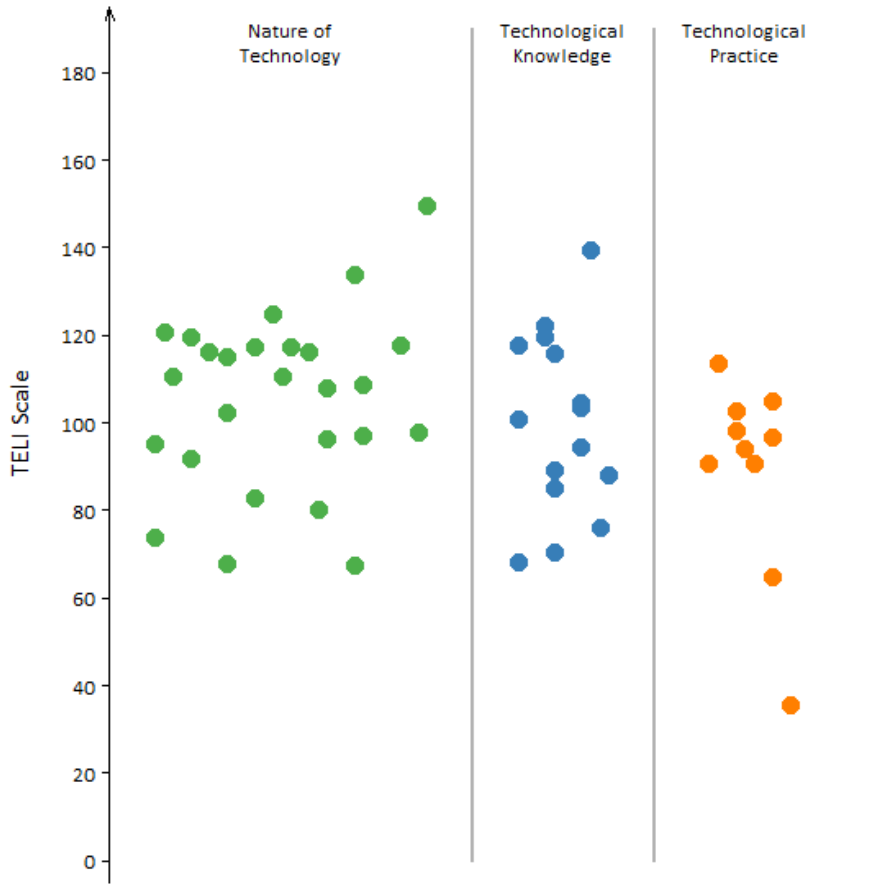


Figure 3.8 Item map for the TELI assessment by strand

Summary

Seventy-three percent of Year 4 students achieved above the minimum score on the TELI scale associated with achieving curriculum level 2 objectives. Fifty-three percent of Year 8 students achieved above the minimum score on the TELI scale associated with achieving curriculum level 4 objectives.

The average TELI score for Year 8 students was 38 units higher than Year 4 students. This difference indicates that students make about 10 scale score units of progress per year between Year 4 and 8.

There were significant differences in achievement by gender, ethnicity and school decile at both year levels.

The average TELI score for girls was about 6 units higher than boys at both year levels.

The average TELI score for Māori and Pasifika students was 11 TELI units lower than non-Māori and about 14 TELI units lower than non-Pasifika students, respectively. These differences are roughly equivalent to the amount of progress associated with one year of instruction and one and a half years of instruction, respectively.

The average TELI score for students from low decile schools was 20 TELI units lower than high decile schools and about 14 TELI units lower than mid decile schools, respectively. The difference between high and low decile schools is roughly equivalent to two years of instruction.

On average, the items representing each strand have very similar difficulties.

4 Contextual Factors Associated with Learning in Technology

This chapter uses data collected from student, teacher and principal questionnaires to describe a range of contextual factors associated with learning in technology. The chapter is organised thematically, combining insights from the student, teacher and principal data as appropriate. The themes are: student characteristics, attitudes to technology; learning opportunities in technology; the teaching of technology; and the resourcing of technology. After a brief description of who completed the questionnaires, the chapter focuses on each theme in turn.

1. Completion of the questionnaires

The student questionnaire

All students (2,337 at Year 4 and 2,284 at Year 8) completed a computer-based questionnaire, arranged in several sections. The first section, called *About You,* focused on two introductory questions about the students themselves. The remaining sections focused on their attitudes to technology and their opportunities to learn technology at school.

The teacher questionnaire

Up to three teachers in each school completed a teacher questionnaire. In total, 231 Year 4 teachers and 270 Year 8 teachers responded. Table 4.1 shows the percentage of teachers responding to the questionnaire at each year level, by school decile band.

Table 4.1 Percentage of responses to the teacher questionnaire, by year level and school decile

	Percentage of teachers	
School decile	Year 4 *N = 231*	Year 8 *N = 270*
Low	21	20
Mid	41	39
High	38	41

For the technology section of the questionnaire, at Year 4, there were about 20 teachers who had missing data for one or more questions. At Year 8, there were about 59 teachers who had missing data for one or more questions. The results reported for each question did not include the missing data.

Both classroom teachers and specialist technology teachers were asked to respond to the questionnaire. One percent of the Year 4 teachers and 36 percent of the Year 8 respondents reported being employed as specialist technology teachers.

The majority of teachers who responded to the questionnaire at both year levels were females (Year 4: 85 percent; Year 8: 68 percent). About 30 percent of teachers at both year levels had been teaching for 11–20 years, while a similar proportion had been teaching for more than 20 years (Year 4: 28 percent; Year 8: 34 percent).

Year 8 teachers were asked which areas of technology they taught. Table 4.2 shows the percentage of classroom and specialist Year 8 teachers teaching each area of technology.

Table 4.2 Percentage of Year 8 teachers teaching each area of technology

Percentage of Year 8 teachers	
Technology	Total *N* = 212 %
Textiles	17
Resistant materials	19
Food technology/biotechnology	21
Computer programming/robotics	10
Electronics	15
Media	14

Note: 4 percent of teachers did not respond to this question

Teachers were asked about their qualifications, experiences and their interest and confidence in teaching technology, their pedagogical approaches to teaching technology and the resources available to them for teaching technology. Teachers also identified the opportunities their students had to learn technology at school and the professional support and development they experienced in relation to teaching technology.

The principal questionnaire

In total, 182 principals from 200 schools completed the principal questionnaire; 91 from each year level. Table 4.3 shows the percentage of principals who responded by school decile band for each year level.

Table 4.3 Percentage of principals who responded to the questionnaire, by year level and school decile

	Percentage of principals	
School decile band	Year 4 *N* = 91	Year 8 *N* = 91
Low	20	24
Mid	44	36
High	36	40

Principals were asked about school structures and provisions that support technology learning, the extent to which teachers could access specialist support and professional learning and development (PLD) in technology.

It is important to note that the teachers and principals who completed the questionnaires do not necessarily constitute nationally representative samples. The findings discussed in this chapter should be interpreted as a broad indication of teachers' and principals' views about technology.

2. Student characteristics

This section describes how students responded to two questions about themselves: how often they spoke English at home and how much they liked school. The students' responses are related back to achievement patterns. Findings are presented by year level, ethnicity and school decile band.

Speaking English at home

Students were asked to indicate how much they spoke English at home. They responded by selecting one of the following: 'Never', 'Hardly ever', 'Often' or 'Always'. At both year levels, about 80 percent of students reported that they always spoke English at home and a further 17 percent reported that they often spoke English at home. These percentages were similar for girls and boys at both year levels.

Figures 4.1 and 4.2 show how often English was reported to be spoken at home by ethnicity. At both Year 4 and Year 8, greater proportions of New Zealand European (NZE) and Māori students reported always speaking English at home than did Pasifika or Asian students.

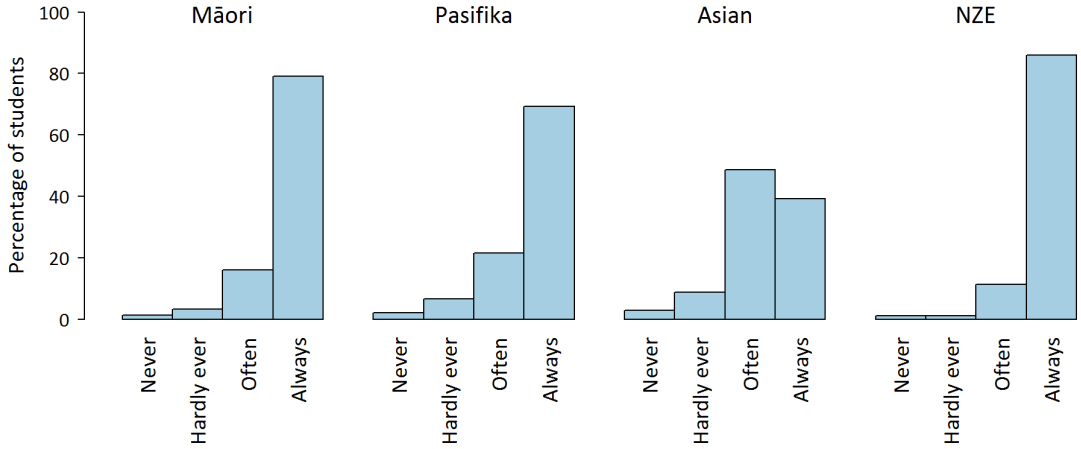


Figure 4.1 Year 4 percentage frequency of how often English is spoken at home, by ethnicity

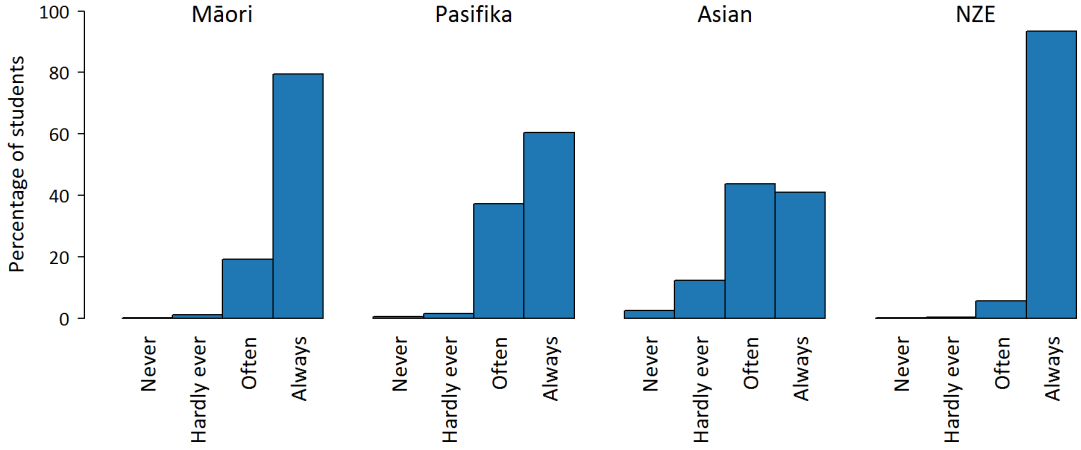


Figure 4.2 Year 8 percentage frequency of how often English is spoken at home, by ethnicity

Differences in response by school decile band were also apparent at both Year 4 and Year 8, with slightly smaller proportions of students from low decile schools reporting that they always spoke English at home, compared with students from mid and high decile schools.

Speaking English at home and achievement

Figures 4.3 and 4.4 show the relationship between students' reports of the amount of English spoken at home and their scores on the TELI assessment for Year 4 and Year 8 students, respectively. At both year levels, speaking English at home more often was associated with higher scores.

The difference in average scores between students who selected the 'Never' and 'Always' response categories was 10 TELI units at Year 4 and 25 TELI units at Year 8. The differences were statistically significant and equivalent to the amount of progress associated with one year, and two and a half years of instruction, respectively.

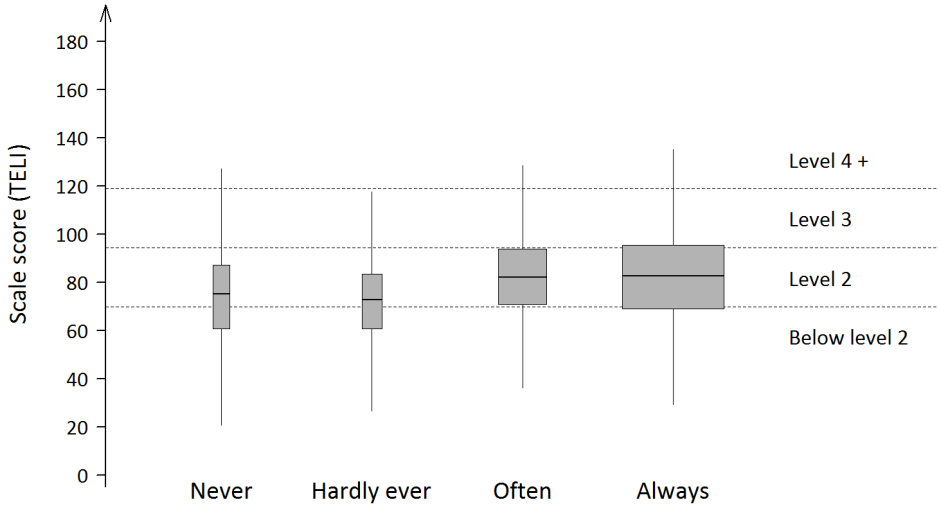


Figure 4.3 Year 4 distribution of scores on the TELI scale, by how often English was spoken at home

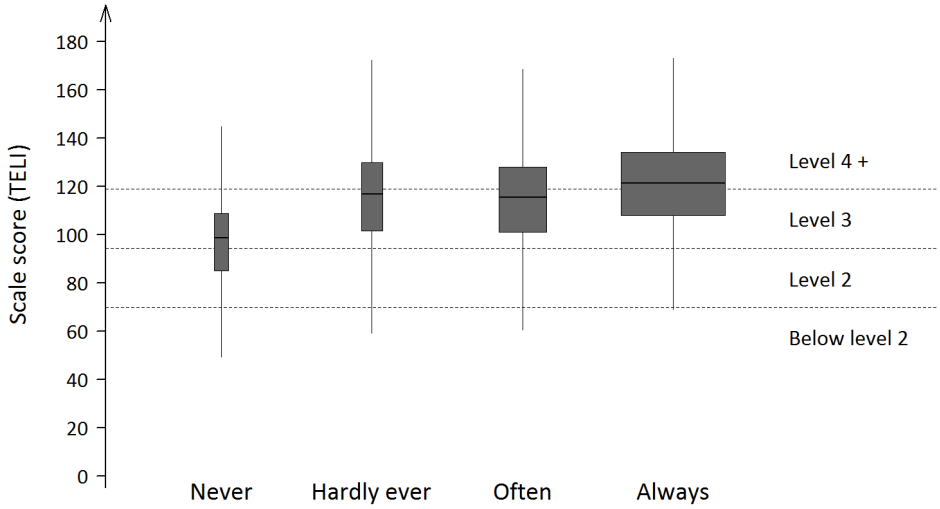


Figure 4.4 Year 8 distribution of scores on the TELI scale, by how often English was spoken at home

Liking school

Students were asked how much they liked school. They responded by selecting one of the following categories: 'Not at all', 'A little', 'Quite a lot', or 'Heaps'. Figure 4.5 shows how students responded, by year level.

In general, Year 4 students liked school more than Year 8 students. About 80 percent of Year 4 students reported liking school heaps or quite a lot, compared with 70 percent of Year 8 students.

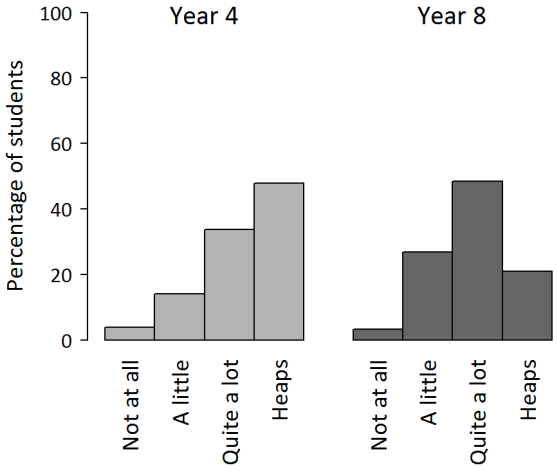


Figure 4.5 Percentage frequency of how much students liked school, by year level

Figures 4.6 to 4.11 show how the students responded by gender, ethnicity and school decile, respectively. At both year levels, a greater percentage of girls than boys responded that they liked school heaps or quite a lot (Figures 4.6 and 4.7).

At Year 4, there was no difference between ethnic groups (Figure 4.8). However, at Year 8, about 90 percent of Pasifika students liked school heaps or quite a lot, compared with 76 percent of New Zealand European and 64 percent of Māori (Figure 4.9).

The percentage of students from low decile schools reported that they liked school heaps was twice as big as the percentage from mid and high decile schools at both year levels (Figures 4.10 and 4.11).

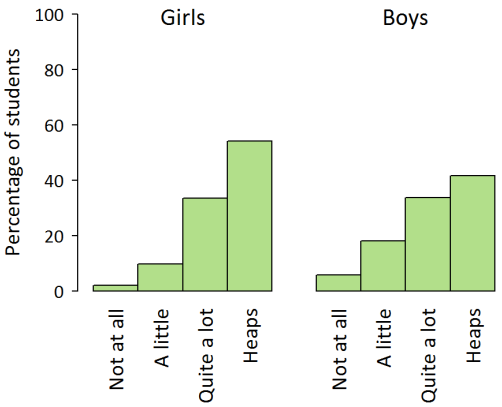


Figure 4.6 Percentage frequency of how much Year 4 students like school, by gender

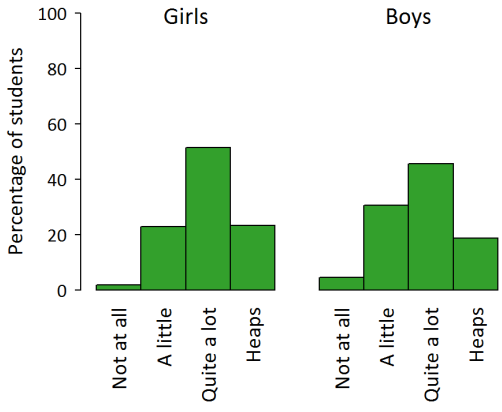


Figure 4.7 Percentage frequency of how much Year 8 students like school, by gender

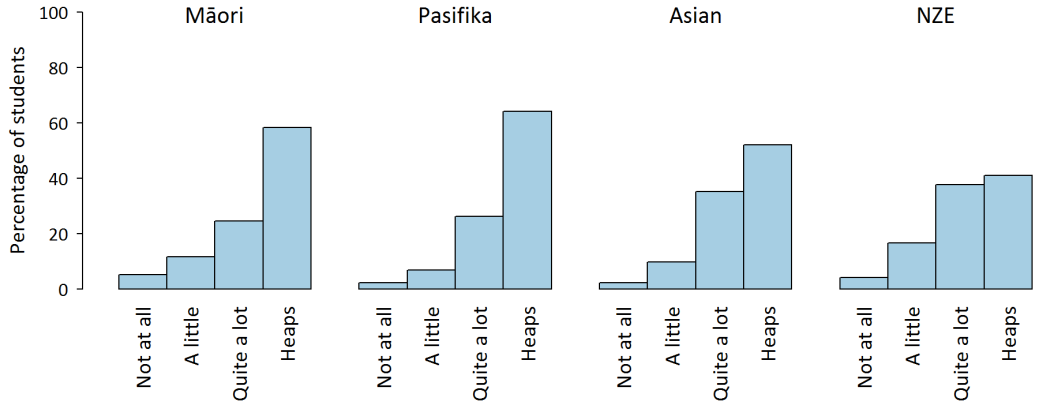


Figure 4.8 Percentage frequency of how much Year 4 students like school, by ethnicity

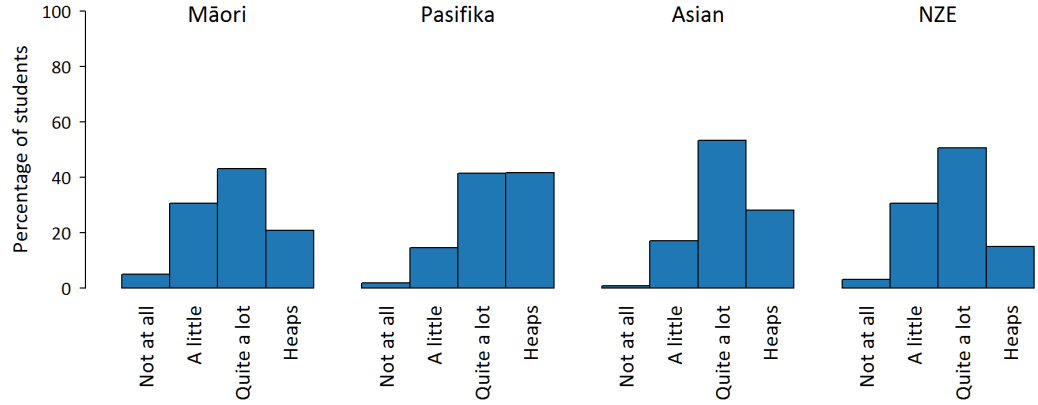


Figure 4.9 Percentage frequency of how much Year 8 students like school, by ethnicity

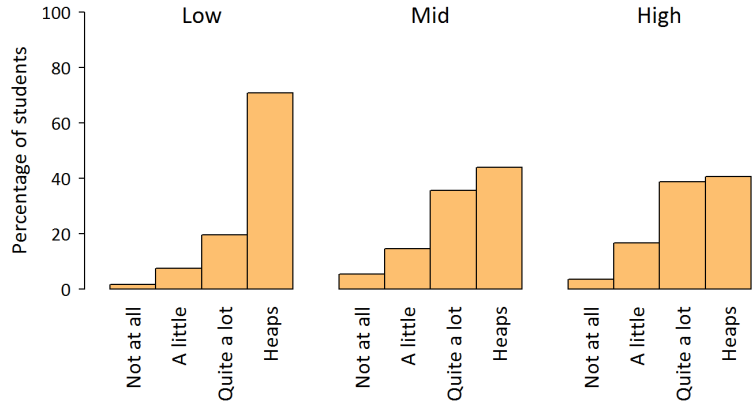


Figure 4.10 Percentage frequency of how much Year 4 students like school, by school decile

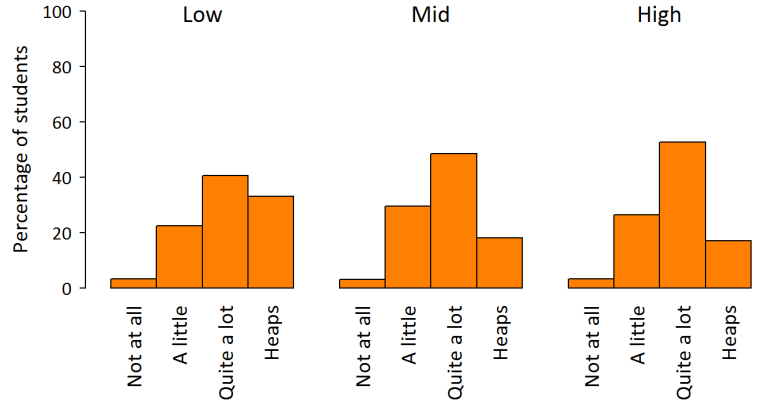


Figure 4.11 Percentage frequency of how much Year 8 students like school, by school decile

Liking school and achievement

Figures 4.12 and 4.13 show the relationship between how much students reported liking school and achievement on the TELI assessment for Year 4 and Year 8, respectively. At both year levels, students who reported they liked school not at all scored lower, on average, on the TELI assessment than other students. However, students who liked school quite a lot, on average, scored slightly higher on the TELI assessment than those who liked school heaps.

Figure 4.12 Year 4 achievement on the TELI scale, by how much students liked school

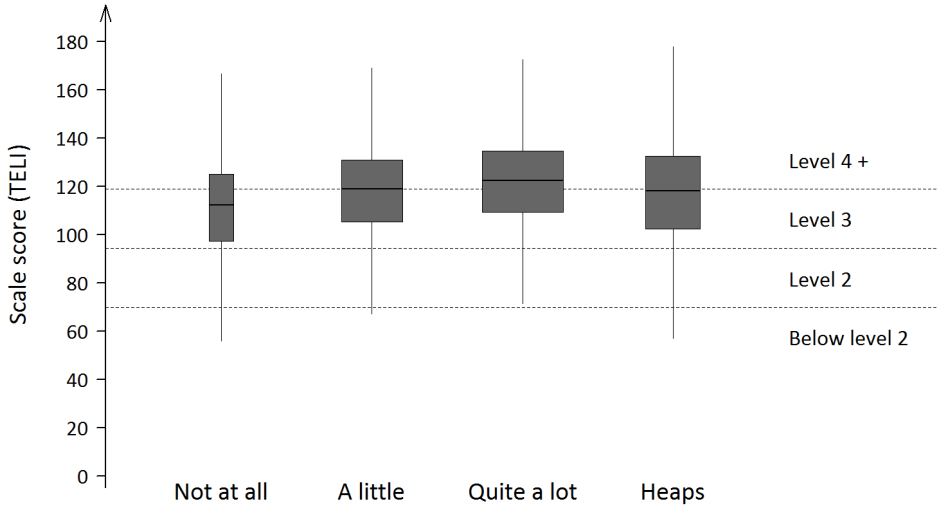


Figure 4.13 Year 8 achievement on the TELI scale, by how much students liked school

3. Students' attitudes to technology

Students were asked how much they agreed with each of a series of statements about their attitudes to technology. Figure 4.14 shows the statements and how Year 4 and Year 8 students responded.

In general, students at both year levels were positive about technology. For the majority of statements, Year 4 students were more likely to respond using 'Totally agree', while Year 8 students were more likely to respond using 'Agree a lot'. A greater proportion of Year 8 than Year 4 students responded 'Agree a lot' and 'Agree' to the statement: 'I like making things in technology at school'.

Māori and Pasifika students, and students with special education needs had a pattern of responses to the attitude statements that was very similar to the pattern recorded for all students.

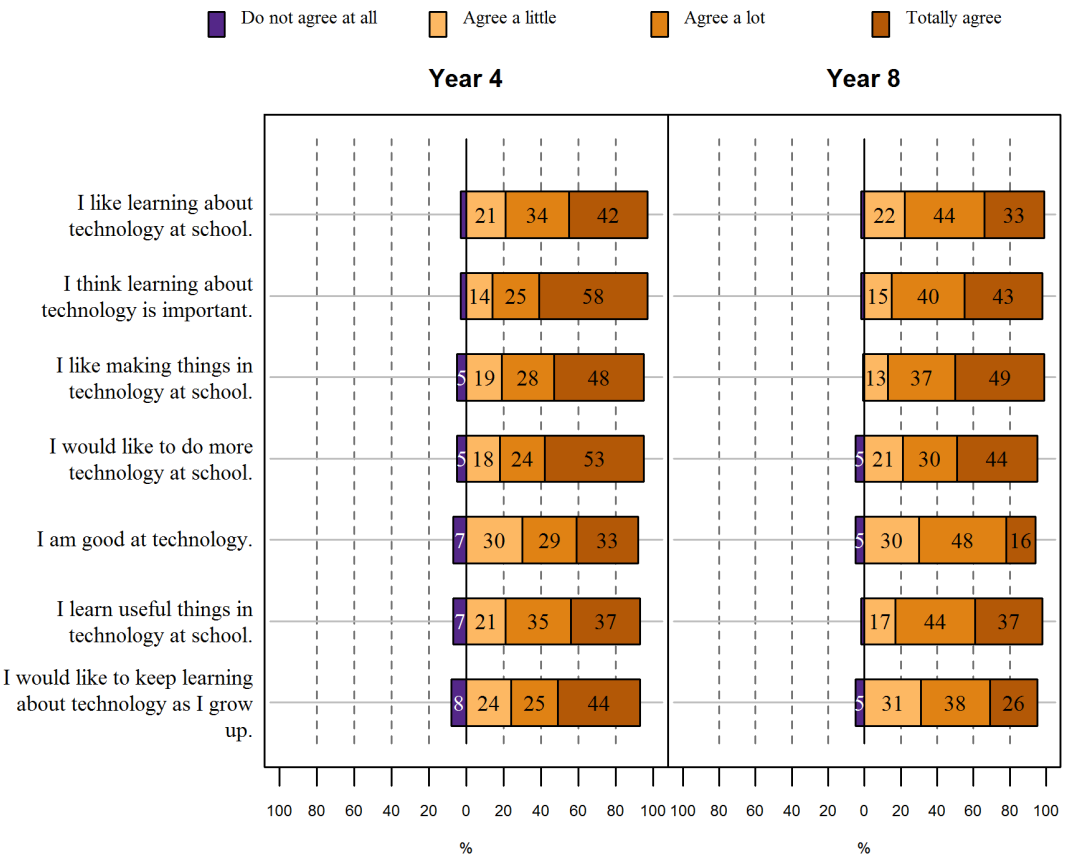


Figure 4.14 Percentage frequency of students' responses to the Attitude to Technology statements, by year level

Attitude to Technology scale

An IRT scale was constructed based on the students' responses to the individual attitudes statements. The scale was called the Attitude to Technology (ATT) scale. The scale was divided into three broad regions to indicate the locations on the scale where students were typically 'Not positive', 'Positive' and 'Very positive' in their responses.

Figure 4.15 shows the distribution of ATT scale scores at Year 4 and Year 8. Year 4 and Year 8 students were equally positive about technology with the majority of students' Attitude to Technology (ATT) scale scores being in the positive and very positive categories.

The difference between Year 4 and Year 8 students' attitudes to technology is smaller than that seen in other learning areas reported by NMSSA (English: writing, social studies, English: reading, science, mathematics and statistics, and the Arts) and the National Education Monitoring Project (NEMP).

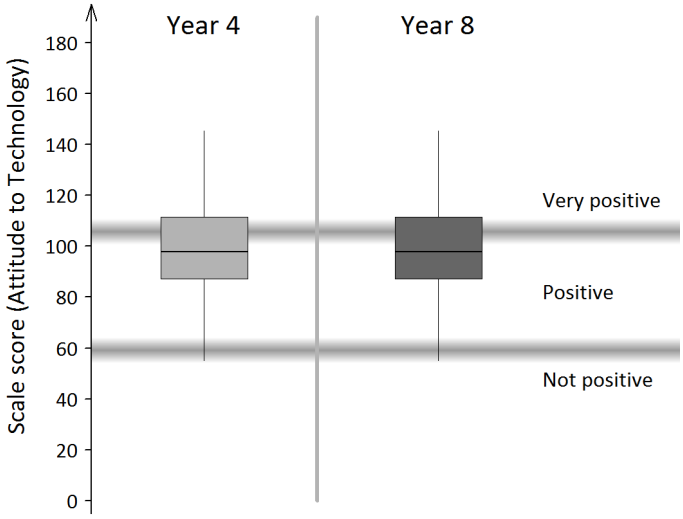


Figure 4.15 Distribution of Attitude to Technology scale scores, by year level

Relationship between attitudes and achievement

The relationship between students' ATT and TELI scale scores at Year 4 and Year 8 is displayed in Figures 4.16 and 4.17, respectively. Year 4 students who had very positive attitudes to technology scored higher on the TELI assessment than those who had negative attitudes. However, very few students had negative ATT scores. There were no differences at Year 8.

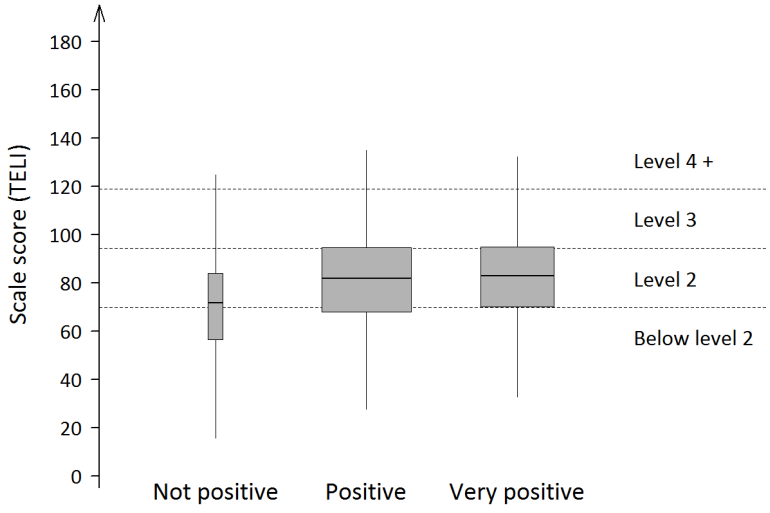


Figure 4.16 Distribution of Year 4 achievement on the TELI scale by levels of Attitude to Technology scale scores

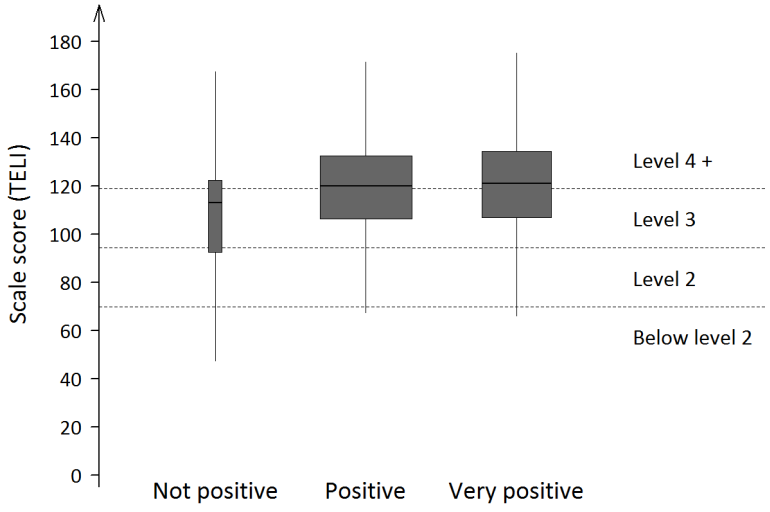


Figure 4.17 Distribution of Year 8 achievement on the TELI scale by levels of Attitude to Technology scale scores

4. Learning opportunities in technology

Students and teachers were asked about the opportunities students had to learn technology in school. This section reports their responses.

Students' views about opportunities to learn technology

Students were asked to rate how often they were involved in each of a list of opportunities to learn technology at school. Figure 4.18 shows the opportunities that were rated and how students responded by year level.

Overall, Year 8 students reported more frequent opportunities to learn technology at school than Year 4 students. With the exception of two opportunities, about 80 percent of Year 4 students reported they experienced each opportunity at least sometimes in contrast to over 90 percent of Year 8 students. Thirty–60 percent of students reported they never 'Work in class with people from our community who know about technology' or 'Go on school trips to learn about technology'. The most frequently experienced

opportunities were related to the strand of technological practice: 'Talk about and make models of our design ideas', 'Look at and talk about a brief' and 'Explore and work with different materials'.

Year 8 students were also asked how often they 'Use what they know from other subjects (e.g. science, mathematics) in technology'. Over 90 percent reported that they did this at least sometimes.

The patterns of responses to the statements about learning opportunities for girls and boys, Māori and Pasifika students, and students with special education needs were very similar to the pattern of responses for all students at both year levels.

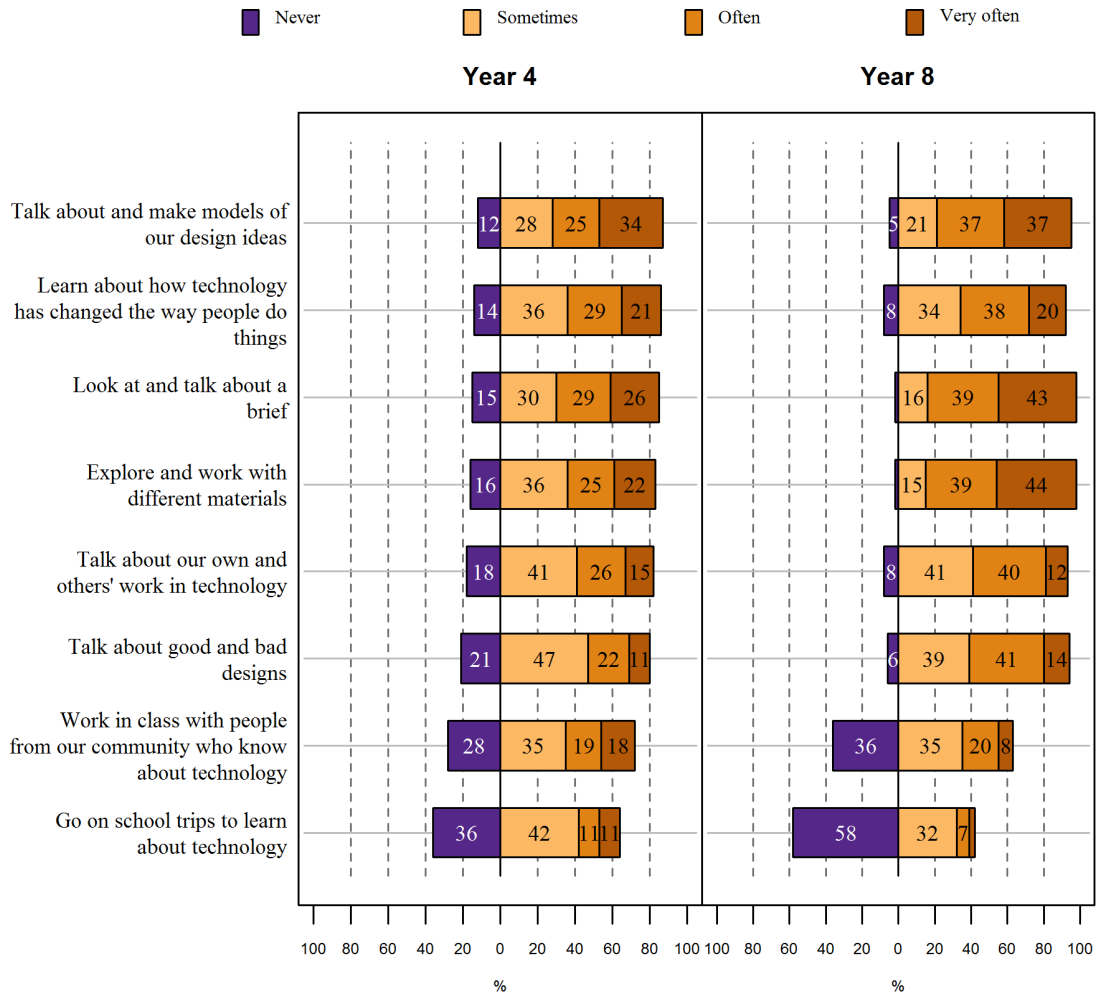


Figure 4.19 Percentage frequency of student responses about learning opportunities in technology, by year level

Teachers' views of opportunities to learn technology

Teachers were also asked to indicate how often students in their class took part in the same range of opportunities to learn technology. Figure 4.18 shows how Year 4 and Year 8 teachers responded.

Overall, Year 8 teachers reported their students had more frequent opportunities to learn technology in a variety of ways than Year 4 teachers. This might be explained, in part, by Year 8 students having more time given to learning technology compared to Year 4 students.

Most opportunities were reported by more than 90 percent of Year 4 and Year 8 teachers as occurring 'Occasionally', 'Quite often' or 'Very often'. The exceptions included 25 percent of Year 4 students not having opportunities to 'Look at and talk about a brief'; and students at both year levels to: 'Work in class with people from the community who know about technology', and 'Go on school trips to learn about technology'.

Overall, teacher and student reports of opportunities to learn technology were broadly similar. Any differences between student and teacher responses were greater at Year 4 than at Year 8. Generally, a greater percentage of students reported never experiencing some opportunities than teachers. It should be noted that the sample of teachers was only broadly nationally representative, and that they were not necessarily the teachers of the students in the study.

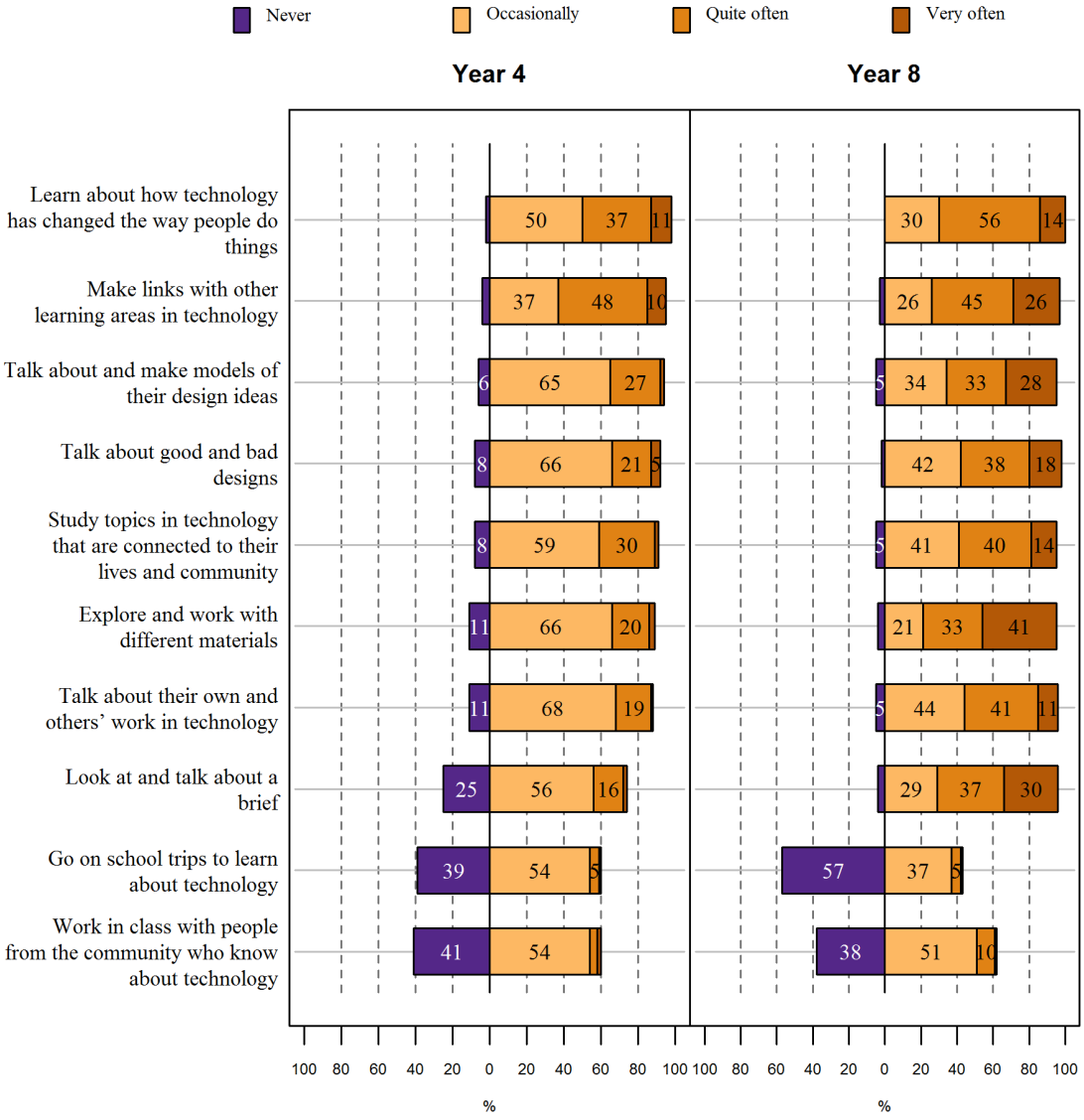


Figure 4.18 Percentage frequency of teacher responses to statements about learning opportunities for students in technology, by year level

5. Teaching and learning technology

This section looks at the teaching and learning of technology. It begins by reporting the areas of technology studied in Year 8, and then exploring school structures that support technology learning, including who teaches technology at Year 4 and Year 8 and their qualifications and experiences. It then goes on to look at teachers' attitudes to technology, school-wide policies and practices in technology, professional interactions related to technology, and the amount and quality of professional learning and development (PLD) and resourcing available in schools.

Areas of technology studied at Year 8

Year 8 students were asked which areas of technology they had studied during the school year. Figure 4.20 shows this information.

Just over 70 percent of Year 8 students studied resistant materials (e.g. wood, metal) and food technology/biotechnology. About half studied textiles. Less than 30 percent studied each of computer programming/robotics, electronics and media.

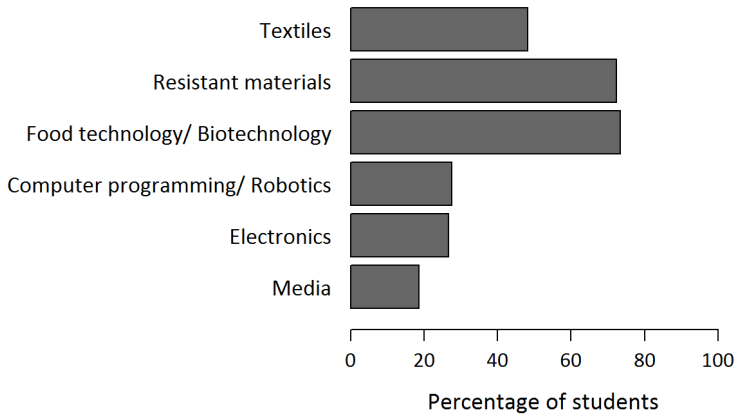


Figure 4.19 Percentage frequency of Year 8 students studying each area of technology

Using a difference of 15 percentage points as the criterion to indicate a notable difference, there were no notable differences in terms of gender, ethnicity or school decile in the percentage of students taking each technology option.

School structures that support technology learning

Principals were asked if their school had a technology centre and, if so, whether they provided teaching by technology specialists for students from other schools. Table 4.4 shows that 7 percent of Year 4 principals (four from full primary schools and two from contributing schools) and 67 percent of Year 8 principals reported their school had a technology centre. Where there were technology centres, 60 percent of Year 4 schools and 47 percent of Year 8 schools taught students from other schools.

Table 4.4 Percentage of principals reporting their school had a technology centre and provided teaching for students from other schools, by year level

	Percentage of principals	
Resource	Year 4 *%*	Year 8 *%*
Has a technology centre	7	67
Of the schools with technology centres: the technology specialist teaches students from other schools	60	47

Responsibility for teaching technology

Of the teachers who completed the questionnaire, 13 percent at Year 4 and 27 percent at Year 8 had syndicate or school leadership responsibility for technology teaching and learning.

Principals were asked how technology was taught in their school. Table 4.5 shows how they responded. At Year 4, technology was most frequently taught totally by the classroom teacher (78 percent) or with the support of a specialist (13 percent).

The picture at Year 8 was more complex. Six areas of technology were taught as separate subjects: textiles, resistant materials, food/biotechnology, computer programming/ robotics, electronics and media. They were not uniformly available to students in all schools. For example, electronics, media, computer

programming, and textiles were not available to students in 42, 33, 22 and 16 percent of the schools, respectively. In Table 4.5, the percentage of principals reporting how each area of technology was taught in their school was calculated using the number of schools where that area of technology *was* available.

At Year 8, all areas of technology, except for media, were taught either entirely by a specialist or mainly by a specialist with support of the classroom teacher in 75–94 percent of schools. Media was taught, in equal measure, either entirely by the specialist teacher, entirely by the classroom teacher, or shared between classroom and specialist teachers.

Teachers were asked what responsibility they had for teaching their students technology. Eighty-three percent of Year 4 teachers indicated they had sole responsibility for teaching technology, compared with 7 percent at Year 8. At Year 8, the responsibility was shared with someone else (a specialist) or a specialist had sole responsibility (45 percent compared with 48 percent).

Very few schools employed external providers to deliver their technology programme. When asked to list external providers, principals primarily referred to a technology centre or specialists at another school.

Table 4.5 Percentage frequency of principals reporting how areas of technology were taught in their school, by year level

Percentage of principals							
Teaching of technology	Year 4	Year 8 (Areas of technology)					
	Technology	Textiles	Resistant materials	Food technology	Computer programming	Electronics	Media
	N = 83	*N = 76*[15]	*N = 85*	*N = 88*	*N = 67*	*N = 49*	*N = 56*
Totally by the classroom teacher	78	3	-	1	16	10	34
Totally by a specialist teacher	5	81	87	76	53	63	36
Mainly by a specialist teacher with some support from the classroom teacher	4	13	13	7	22	20	18
Mainly by classroom teacher with some support from a specialist teacher	13	1	-	16	7	2	13
By an external provider (e.g. Mindlab)	-	1	-	-	1	4	-

Training and qualifications

Teachers were asked to indicate the qualifications, training and/or practical experience they had in technology by ticking all that applied from a list of possible qualifications. Table 4.6 shows how they responded.

Table 4.6 Percentage frequency of teachers reporting qualifications, training and/or practical experience they had in technology, by year level

	Percentage of teachers	
Response	Year 4	Year 8
Specialist technology education focus in initial teacher education programme	4	14
Undergraduate or postgraduate qualifications in technology	2	12
Worked in a technology industry (e.g. designer, manufacturer)	3	14

Overall, there was a relatively low proportion of teachers with each of these types of qualifications, training and/or practical experience in technology. A slightly greater proportion of Year 8 teachers reported each form of qualification, training or experience than Year 4 teachers.

[15] The number of schools at Year 8 where each area of technology was not taught: Textiles, 16; Resistant materials, 7; Food technology, 3; Computer programming, 22; Electronics, 42; Media, 33

Teachers were also able to indicate that they had other qualifications, training and/or practical experience in technology not provided in the list of qualifications. Seven percent of Year 4 teachers and 20 percent of Year 8 teachers gave an 'Other' response. Examples of 'other' responses were:

- experience in trades, industry or profession
- certificates or university qualification in related fields, including ICT, teaching, PLD, construction
- previous experience as a technology or classroom teacher.

Teacher confidence and engagement in teaching technology

Teachers were asked to indicate how true each of a series of statements was for them regarding their confidence and engagement with the technology learning area. Figure 4.21 shows the statements and how teachers responded. Year 8 teachers were more positive than Year 4 teachers about all statements. More than 70 percent of teachers at Year 8 selected the response categories 'Moderately like me' or 'Very like me' for all the statements. More than 70 percent of Year 4 teachers indicated they were personally interested in technology and liked teaching it, drew on students' backgrounds and experiences to support their learning, and were able to motivate students who show little interest in learning technology.

About 40–50 percent of teachers at Year 4 were satisfied with how they taught it and how confident they felt about assessing students' progress and achievement, and supporting students' self-assessment and reflection on their progress.

Year 8 teachers were notably more satisfied with the ways they teach technology than teachers at Year 4.

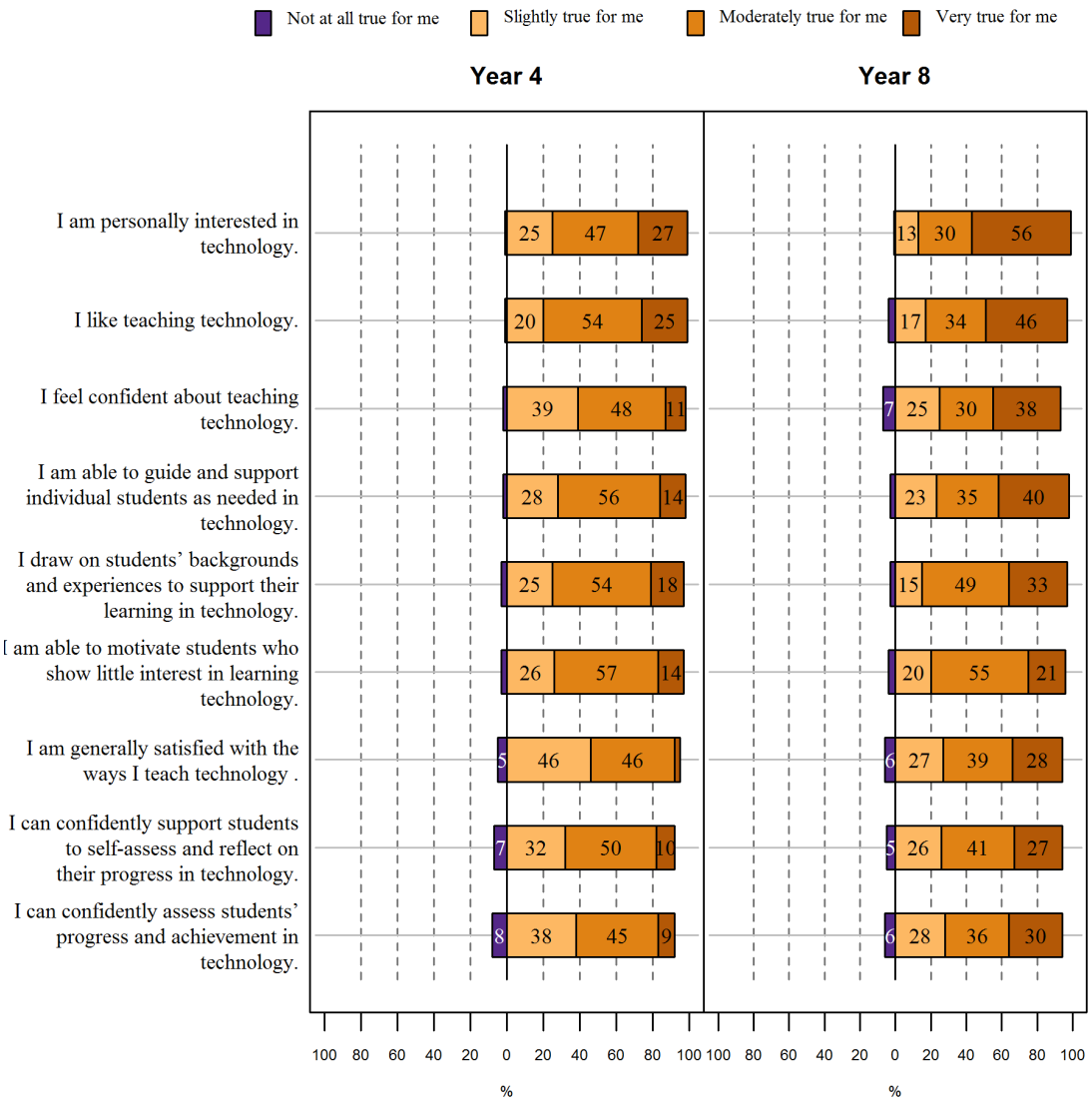


Figure 4.21 Percentage frequency of responses by teachers to statements about confidence and engagement in technology, by year level

Principals' views of teachers' knowledge and practices

Principals were asked to rate how much two statements describing teachers' level of knowledge and practices resembled what happened in their schools. Figure 4.22 shows the statements and how principals responded.

A markedly higher percentage of principals at Year 8 than at Year 4 indicated that the statements described features that were either 'Moderately like our school' or 'Very like our school'.

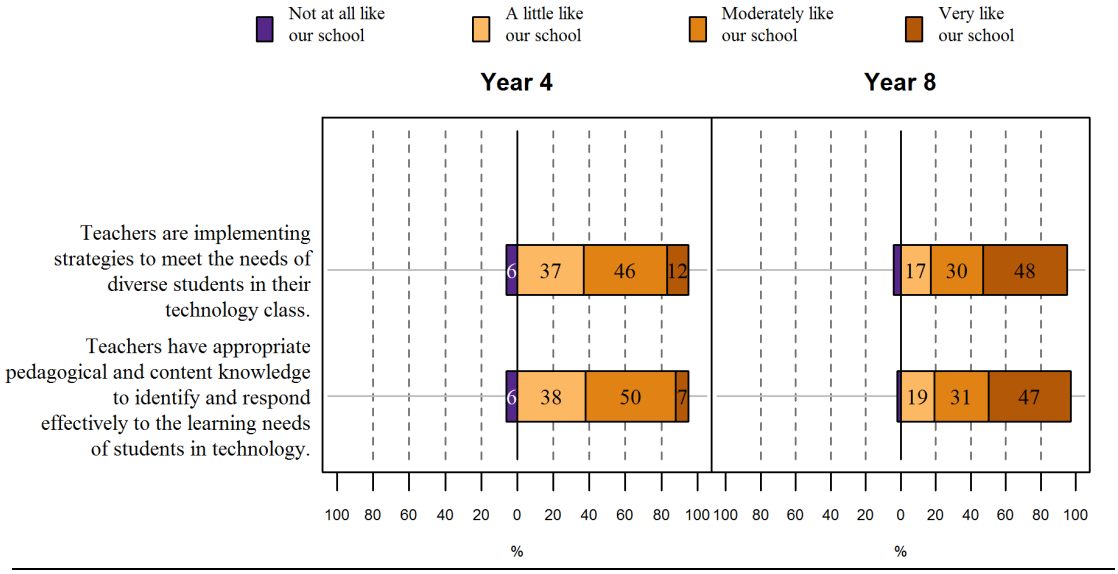


Figure 4.22 Percentage of principals responding to statements about teachers' level of knowledge and practices about teaching technology, by year level

Principals were asked to rate their school's provision for learning in technology overall. Year 8 principals were more positive than Year 4 principals with approximately 90 percent of Year 8 principals rating it as good, very good or excellent compared with 60 percent of Year 4 principals. (Figure 4.23).

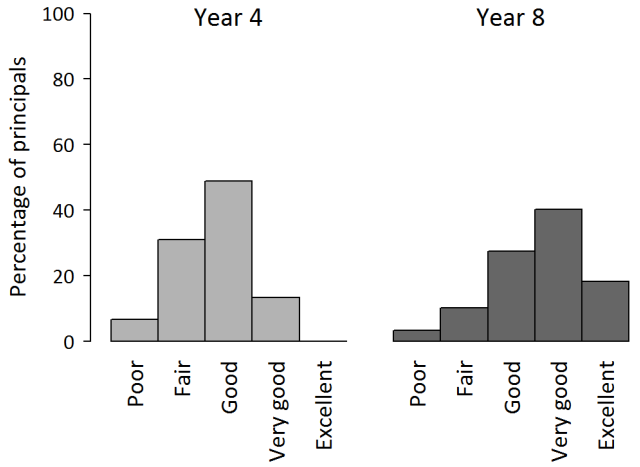


Figure 4.23 Percentage of ratings by principals of the schools' overall provision for learning technology, by year level

School policies and practices around curriculum guidelines and community engagement

The principals rated two statements related to guidelines for teaching technology, and engagement with the wider community about the technology programme. Figure 4.24 shows how principals responded to the statements.

Overall, Year 8 principals rated their schools more favourably than Year 4 principals on both statements.

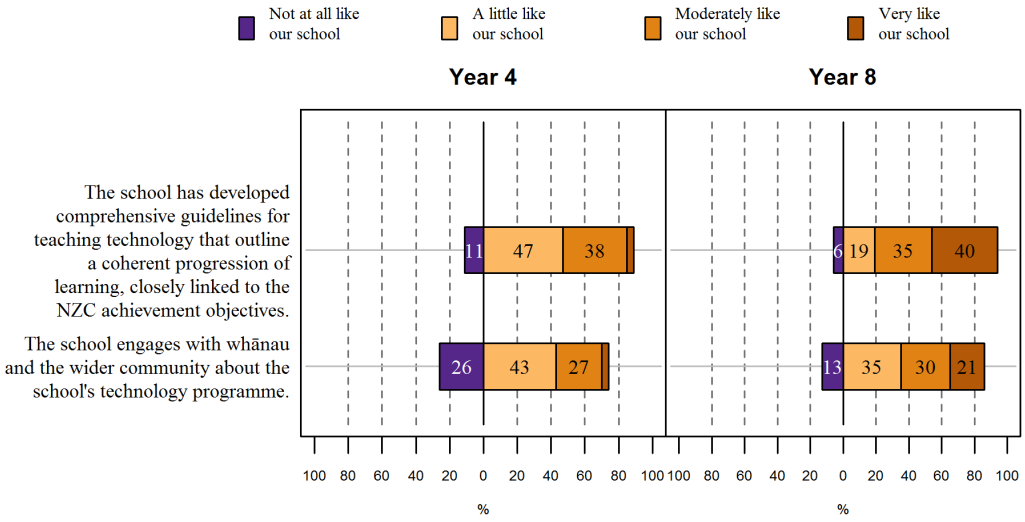


Figure 4.24 Percentage of principals responding to statements about curriculum guidelines and engagement of the wider community in technology, by year level

Strategies for instruction

Teachers and principals were asked how technology was taught in their class or school, respectively. Table 4.7 shows their responses. About 80 percent of Year 4 teachers reported the teaching of technology was mainly integrated with other learning areas, while at Year 8, about half of the teachers reported this approach and the other half reported technology being taught mainly as a separate subject. A far greater percentage of Year 8 principals reported technology being taught as an independent subject.

Furthermore, 77 percent of Year 4 teachers taught technology in a module, unit or block with 18 percent teaching technology in regular weekly lessons. The corresponding figures for Year 8 teachers were 43 percent and 46 percent, respectively.

Table 4.7 Percentage of principals and teachers reporting how technology was taught, by year level

	Percentage			
How technology is taught	Teachers*		Principals	
	Year 4 ***n = 211***	**Year 8** ***n = 195***	**Year 4** ***n = 87***	**Year 8** ***n = 84***
Technology is mainly integrated with other learning areas	83	54	94	29
Technology is mainly taught as an independent subject	10	45	6	71
Technology is taught both as an integrated and independent subject	7	1	-	-

* Only 91 percent of Year 4 teachers and 72 percent of Year 8 teachers responded to this question.

Teachers were asked to indicate approximately how many hours in total their students spent learning technology over the year. Figure 4.25 shows how they responded. In general, Year 8 students tended to learn technology for a greater number of hours than Year 4 students did. At Year 4, 36 percent of teachers reported their students studied technology for 21 hours. At Year 8, 65 percent of teachers reported this.

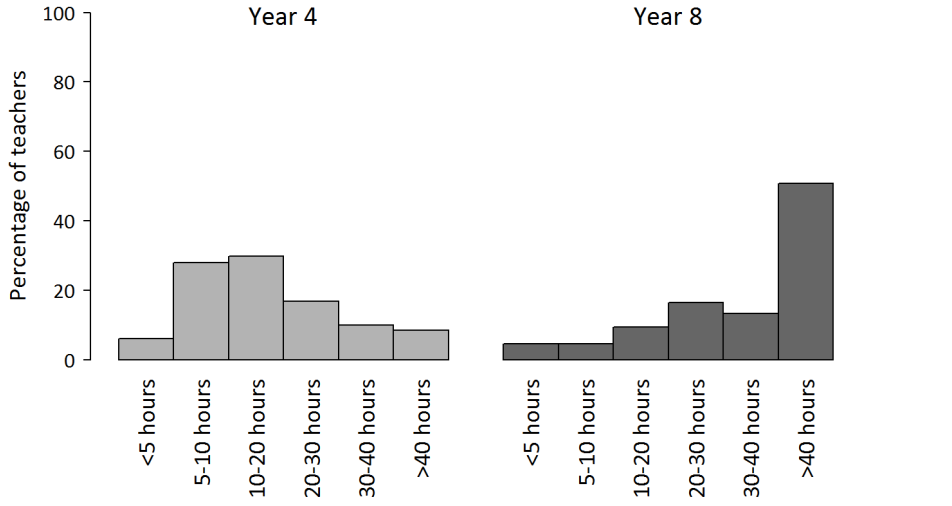


Figure 4.25 Percentage frequency of teachers reporting approxiamtely how many hours their students spent learning technology over the year

Teachers were asked how much of their technology programme was spent on each curriculum strand. Table 4.8 shows the average percentage of the programme dedicated to each strand by year level. Note that only 69 percent of Year 4 teachers and 51 percent of Year 8 teachers answered this question. The time spent on each strand was very similar at each year level. About half of the programme was devoted to technological practice.

Table 4.8 Average percentage of their technology programme teachers reported spending on each strand of the curriculum by year level

	Percentage of programme	
Strand	**Year 4** ***N = 159***	**Year 8** ***N = 137***
Technological practice	46	46
Technological knowledge	25	29
Nature of technology	21	19

* Only 69 percent of Year 4 and 51 percent of Year 8 teachers answered this question.

Teachers were also asked to indicate how often they used a range of instructional strategies for teaching technology to students in their classes. Figure 4.26 presents a series of bar plots showing how teachers responded regarding each strategy at Year 4 and Year 8.

Teachers at both year levels used a mix of instructional strategies. The strategies used by the majority of teachers quite often or very often were whole class activities and mixed ability group-based activities. Different interest or social group-based activities and ability group-based activities were used less often, followed by individualised programmes.

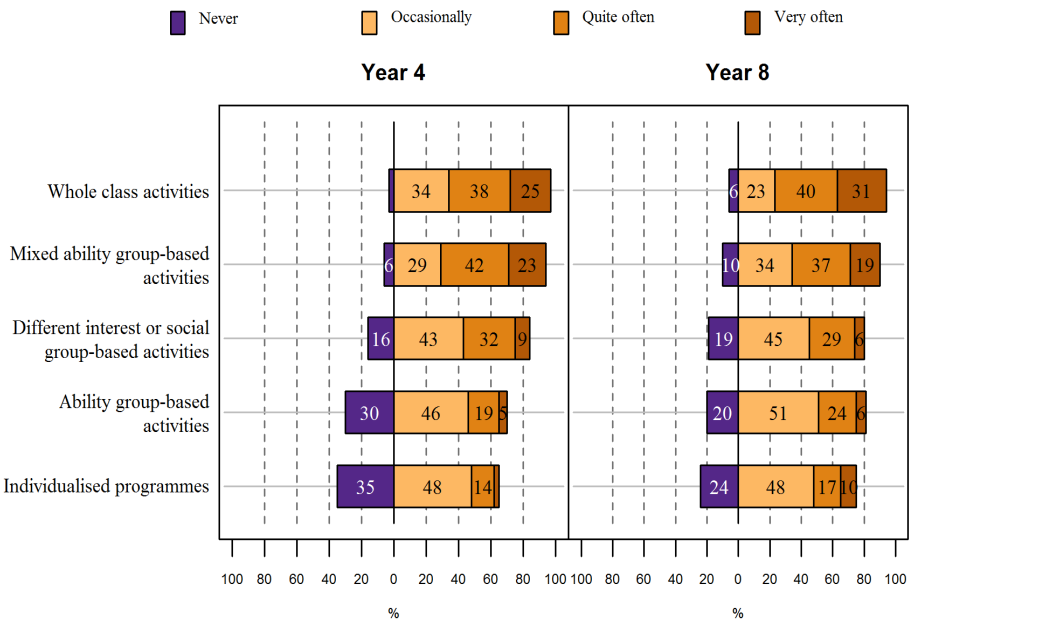


Figure 4.26 Percentage frequencies of different teaching strategies used in technology

Professional support for teaching and learning in technology

Teachers were presented with several descriptions of professional interactions involving teaching and learning in technology and asked to indicate how often they occurred. Figure 4.27 shows how teachers responded in relation to each of the described interactions.

For most of the listed interactions, sizeable proportions of teachers indicated that they 'never or almost never' occurred. This was particularly so for working with a technologist to enhance their own knowledge of technology and observing a colleague teach technology.

Overall, Year 8 teachers indicated that each of the interactions occurred more frequently than Year 4 teachers.

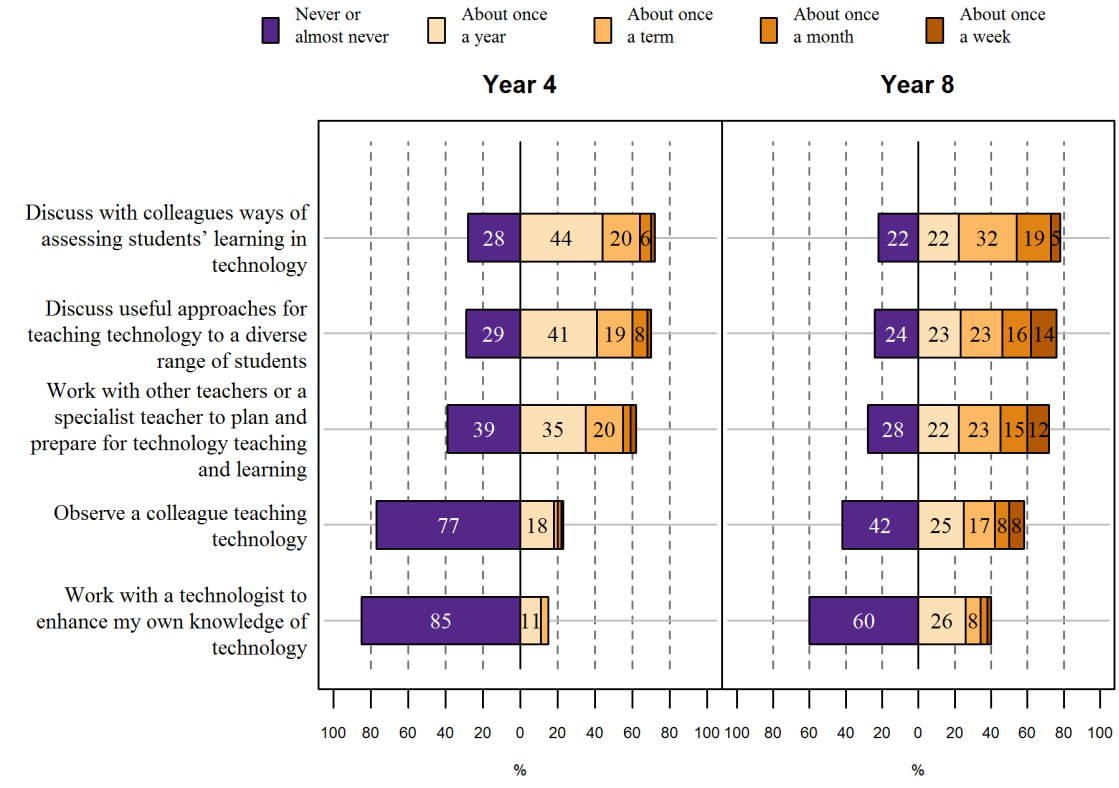


Figure 4.27 Percentage frequency of responses by teachers to descriptions of professional interactions related to teaching technology, by year level

Teachers were asked to rate the overall level of professional support that they received for their teaching of technology (Figure 4.28). In general, Year 8 teachers rated their support levels more favourably than Year 4 teachers did. Six percent of Year 4 and 33 percent of Year 8 teachers rated it as good or excellent, respectively.

Technology Online on TKI

Teachers were asked to indicate if they were aware of the Technology Online on Te Kete Ipurangi (TKI)[16] website, how often they used the site and how easy they found locating the resources they needed from it. The majority of teachers at both year levels were aware of the Technology Online site (Year 4: 62 percent, Year 8: 79 percent). Figure 4.29 shows how often they used the site by year level. At each year level, teachers most commonly used the site occasionally. At Year 8, it was used more frequently by specialist teachers than classroom teachers. Teachers generally found it easy or very easy to locate the resources they needed (Year 4: 69 percent, Year 8: 70 percent).

Technology Indicators of Progression

Compared with Technology Online, fewer teachers were aware of the technology indicators of progression for assessing students' work (Year 4: 38 percent, Year 8: 54 percent). Figure 4.30 shows how often teachers who were aware of the progressions reported using them. At Year 8, 44 percent of teachers reported using them quite often or very often, compared to 14 percent at Year 4. Sizeable percentages of teachers used them occasionally.

Professional learning and development (PLD)

Teachers were asked when they last had any external technology PLD. Seventeen percent of teachers at Year 4 and 45 percent of teachers at Year 8 indicated that they had received PLD in technology in the last two years. The majority of Year 4 teachers (63 percent) had last received PLD more than 6 years ago or never, compared with about a third of Year 8 teachers (36 percent).

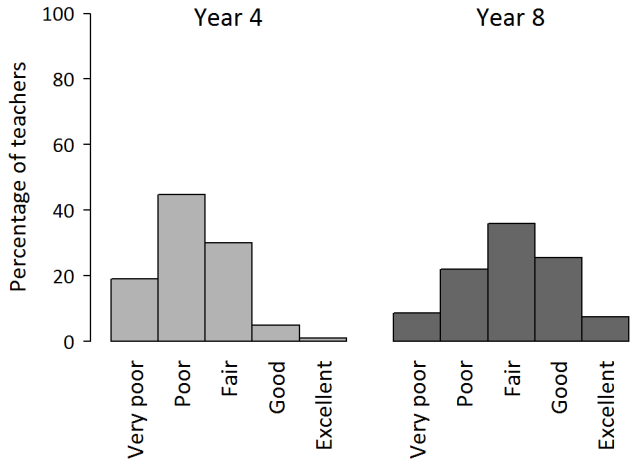


Figure 4.28 Percentage frequency of ratings by teachers about professional support they received for teaching technology, by year level

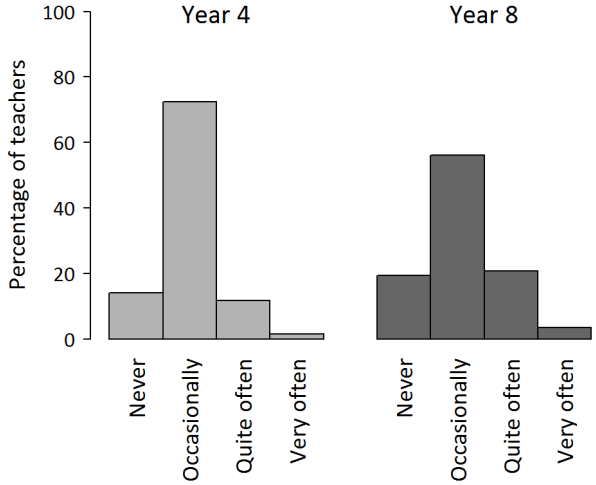


Figure 4.29 Percentage frequency of teachers' use of the Technology Online website, by year level

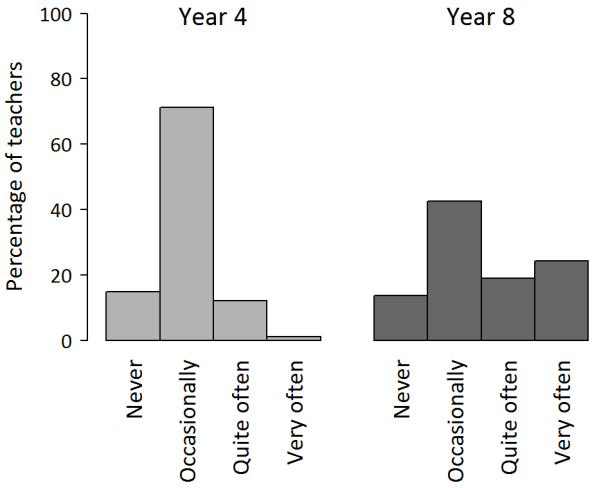


Figure 4.30 Percentage frequency of teachers who are aware of the Technology Indicators of Progressions' use of the indicators, by year level

[16] Te Kete Ipurangi (TKI) *https://www.tki.org.nz/*

Principals were asked how much access teachers in their school had to technology PLD. They responded by selecting from: 'none', 'little access', 'moderate access' and 'extensive access'. The majority of Year 4 principals (69 percent) selected none or little access. In contrast, the majority of Year 8 principals (57 percent) reported that access to PLD was moderate or extensive.

Principals were also asked whether technology had been a focus area for development in their school in the last five years. Figure 4.31 shows how they responded. About 58 percent of Year 4 principals and 32 percent of Year 8 principals indicated that technology had not been a focus for development in the last five years.

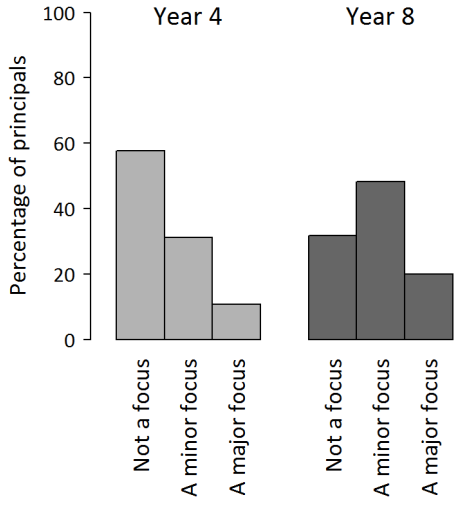


Figure 4.31 Percentage frequency of technology being a focus area for development in the last 5 years reported by principals, by year level

The proportion of principals reporting some focus on technology was greater at Year 8 than Year 4, with about 10 percent of Year 4 principals and 20 percent of Year 8 principals reporting that technology had been a major focus for development.

6. Resourcing technology

This section describes how teachers and principals responded to questions about the resourcing of the technology programme in their school.

Teachers' responses

Figure 4.32 shows how teachers responded when asked to indicate how much access they had to spaces, equipment and materials for teaching technology.

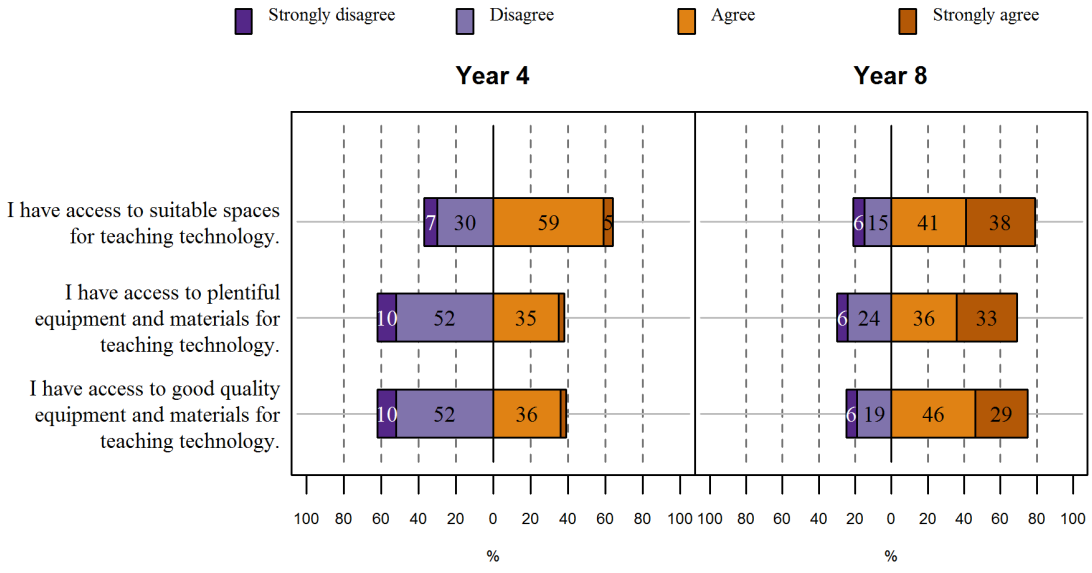


Figure 4.32 Percentage frequency of teachers reporting access to spaces, equipment and materials for teaching technology, by year level

Year 8 teachers were more likely than Year 4 teachers to strongly agree with the listed statements and less likely to disagree. The majority of Year 8 teachers reported having access to suitable spaces, plentiful equipment and materials, and good quality equipment and materials. While 64 percent of Year 4 teachers reported having access to suitable spaces, markedly fewer reported having access to plentiful equipment and materials, and good quality equipment and materials.

Principals' responses

Principals provided a similar response to teachers. They were asked to rate how well the statement 'the school has sufficient facilities, equipment and resources to allow all students to participate effectively in technology learning' described their school. They responded by selecting from: 'not at all like our school', 'a little like our school', 'moderately like our school' and 'very like our school'. Eighty percent of Year 8 principals and 66 percent of Year 4 principals responded using 'moderately like' or 'very like' their school categories.

Year 8 principals were also asked what specialist rooms and equipment were available in their school for teaching technology. Table 4.9 presents their responses. The majority of principals reported that their school had specialist rooms and equipment for teaching most areas of technology, particularly a food technology room with kitchen appliances, and resistant materials room with workshop tools. Only 30 percent of schools had a media suite. Other facilities available in some schools included mobile computers and other digital/design equipment rather than a computer lab, and flexible technology/design hubs for a range of uses in technology and other learning areas, such as the arts. Only 3 percent of principals wrote that they had none of the specialist rooms/equipment.

Table 4.9 Percentage of Year 8 principals reporting their school had specialist rooms and equipment for teaching technology

Percentage of Year 8 principals	
Room/equipment	*N = 91* *%*
Food technology/biotechnology room with kitchen appliances	71
Resistant materials room with workshop tools	63
Textile room with sewing equipment	54
Computer lab	54
Media suite	30
Other	21

7. Summary

From students

About 80 percent of students at both year levels reported that they always spoke English at home. Similar proportions of NZ European and Māori students always spoke English at home, compared with Pasifika and Asian students.

The amount of English spoken at home was related to achievement. The average TELI score of students who always spoke English at home was higher than those who never did. At Year 4, the difference was 10 TELI units and at Year 8, the difference was 25 TELI units, which equate roughly to the amount of progress associated with one year and two and a half years of learning, respectively.

Overall, Year 4 students liked school more than Year 8 students. About 80 percent of Year 4 students reported liking school heaps or quite a lot, compared with 70 percent of Year 8 students. The groups of students who reported liking school heaps included a notably greater percentage of Year 4 girls than boys, Year 8 Pasifika students than non-Pasifika, and students in low decile schools than in mid or high decile schools.

There was a complex association between how much students liked school and achievement. Students who did not like school at all scored lower, on average, than those who liked it quite a lot, or heaps.

Year 4 and Year 8 students were equally positive about technology. There was little association between students' attitudes to technology and their achievement in technology.

Year 8 students reported more frequent opportunities to learn technology at school than Year 4 students with experiences related to the technological practice strand of the curriculum being the most frequent. This pattern was broadly similar to the experiences reported by teachers.

Frequent involvement in several of the learning opportunities was positively correlated with achievement at Year 8. These included opportunities involving activities related to technological practice. There was no such relationship at Year 4.

Of the Year 8 students, about 70 percent studied resistant materials and food technology/biotechnology, 50 percent studied textiles and less than 30 percent took each of computer programming/robotics, electronics and media. This pattern was consistent by gender, ethnicity and school decile.

From teachers

Overall, teachers were positive (confident and engaged) about technology and teaching it. However, Year 8 teachers were more positive than Year 4 teachers.

The teaching of technology was mainly integrated with other learning areas at Year 4 and mainly taught as separate subjects at Year 8.

Year 8 students tended to learn technology for a greater number of hours per year than Year 4 students. About 36 percent of Year 4 students and 65 percent of Year 8 students spent more than 20 hours learning technology.

Of the three technology strands, Technological Practice was taught, on average, for about half of the time associated with the technology programmes at both year levels. The other half of the programmes were devoted about equally to teaching Technological Knowledge and the Nature of Technology.

Teachers at both year levels used a number of instructional strategies to teach technology. Most often these were whole class and mixed ability group-based approaches.

For most of the listed professional interactions related to teaching technology, from 22–39 percent of teachers indicated that they 'never or almost never' occurred. This was particularly so for working with a technologist to enhance their own knowledge of technology (80 and 60 percent of Year 4 and Year 8 teachers, respectively) and observing a colleague teach technology (77 and 42 percent, respectively).

Overall, Year 8 teachers indicated that each of the interactions occurred more frequently than Year 4 teachers.

Year 8 teachers rated the overall level of professional support they received for teaching technology more favourably than Year 4 teachers did, with 6 percent of Year 4 and 33 percent of Year 8 teachers rating it as good or excellent, respectively.

The majority of teachers at both year levels were aware of the Technology Online site, tended to use it occasionally, and found it easy to use in order to locate the resources they needed.

Fewer teachers were aware of the technology Indicators of Progression for assessing students' work with less than half of the Year 8 teachers using them at least occasionally.

Just under half of Year 8 teachers and a fifth of Year 4 teachers had technology-focused PLD in the last two years.

The majority of Year 8 teachers reported having access to suitable spaces, plentiful equipment and materials, and good quality equipment and materials to teach technology. While two thirds of Year 4 teachers reported having access to suitable spaces, the majority reported not having access to plentiful equipment and materials, and good quality equipment and materials.

From principals

About two thirds of Year 8 schools had a technology centre, and about half of them had their technology specialists teach students from other schools.

The classroom teacher was largely responsible for teaching technology at Year 4 and some had support from a specialist technology teacher. At Year 8, a specialist taught all areas of technology, except for media, either entirely or with support of the classroom teacher in the majority of schools. A mix of specialist teachers and classroom teachers taught media.

The majority of principals reported that teachers were implementing strategies to meet the needs of diverse students, and that teachers had appropriate pedagogical content knowledge to identify and respond effectively to the learning needs of students in technology.

Overall, Year 8 principals rated their school's provision for learning in technology higher than Year 4 principals. About 90 percent of Year 8 principals rated it as good, very good or excellent, compared with 60 percent of Year 4 principals, who rated it as good or very good.

Two thirds of Year 4 principals indicated that there was no or little access to external technology-focused PLD. In contrast, nearly two thirds of Year 8 principals reported that access to PLD was moderate or extensive.

About 60 percent of Year 4 principals and 30 percent of Year 8 principals indicated that technology had not been a focus for development in the last five years.

5 Key Findings for Priority Learners

This chapter reports on achievement in technology as measured by the Technological Literacy (TELI) assessment, for students who identified with each of the priority learner groups: Māori students, Pasifika students and students with special education needs. Achievement patterns for each group are examined separately. Each discussion includes commentary on how the priority learner group responded to questions about their attitudes to technology. The final section of the chapter presents summary statistics for the students in each group who scored above the national average at Year 4 and Year 8.

Detailed tables of descriptive statistics including means, standard deviations, sample sizes, effect sizes and 95 percent confidence intervals can be found in the appendix.

1. Māori students

Māori students participating in the study

Table 5.1 shows the number of Māori students in the national sample at each year level by gender and school decile band. Māori students represented about 23 percent of the national samples. There were more Māori boys than girls in the samples. Just over 40 percent of the Māori students were from mid decile schools, just under 40 percent were from low decile schools and about 20 percent from high decile schools.

Table 5.1 Composition of the Māori samples for the 2016 NMSSA technology study

	Number of Māori students	
	Year 4 *N = 570*	Year 8 *N = 514*
Gender		
Girls	270	230
Boys	300	284
School decile band		
Low	208	193
Mid	247	232
High	115	89

Achievement for Māori students

Māori student achievement against the curriculum

Figures 5.1 and 5.2 use line graphs to show the score distribution for Māori students in Year 4 and Year 8, respectively, against the agreed alignment of curriculum levels 2, 3 and 4 with the TELI scale. The score distributions for all students in the national samples are also provided as a reference.

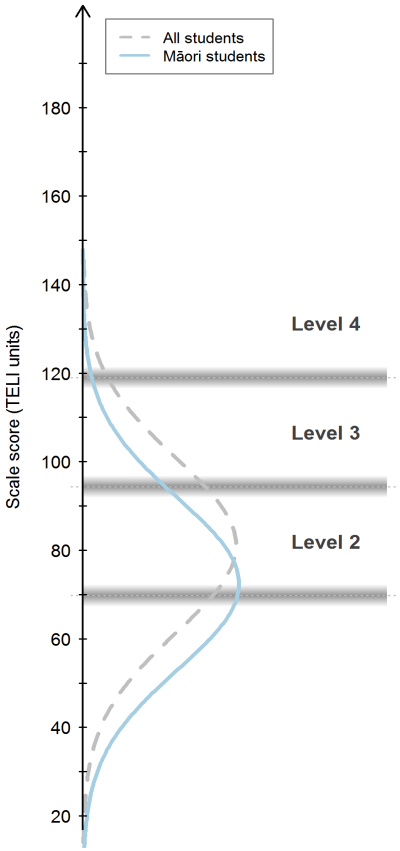


Figure 5.1 Distribution of scores for Year 4 Māori students on the TELI scale against the NZC levels for technology

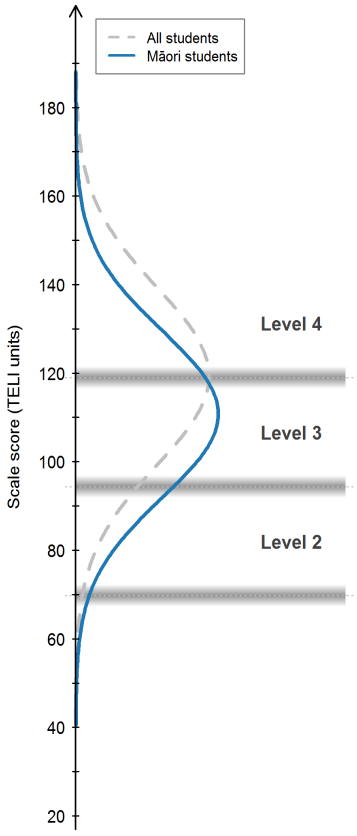


Figure 5.2 Distribution of scores for Year 8 Māori students on the TELI scale against the NZC levels for technology

Table 5.2 shows percentages of Year 4 and Year 8 Māori students achieving against curriculum levels according to the TELI scale. Fifty-seven percent of Year 4 students scored above the minimum score on the TELI scale associated with achieving curriculum level 2 objectives. Thirty-four percent of Year 8 students scored above the minimum score associated with achieving curriculum level 4 objectives.

Table 5.2 Percentage of Year 4 and Year 8 Māori students achieving across curriculum levels according to the Technological Literacy scale

	Year 4		Year 8	
Curriculum level	%	Confidence interval (%)	%	Confidence interval (%)
Level 4 and above	0	(-0.0, 1.0)	34	(29.5, 39.0)
Level 3	12	(9.0, 15.5)	47	(41.5, 52.0)
Level 2	45	(40.0, 49.5)	17	(13.0, 21.0)
Level 1	43	(38.0, 47.5)	2	(0.5, 3.5)

Achievement for Māori students by gender, school decile band and school type

Figures 5.3 and 5.4 use box plots to compare the distributions on the TELI assessment for Māori students by gender, school decile band and type of school in Year 4 and Year 8, respectively.

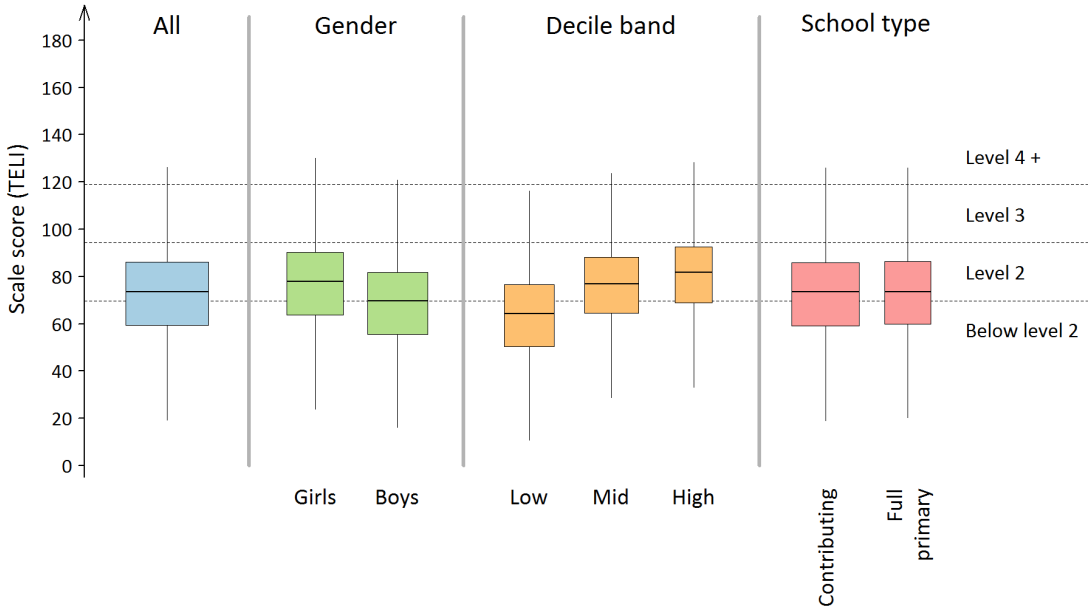


Figure 5.3 Distribution of scores for Year 4 Māori students on the TELI scale, by gender, school decile band and school type

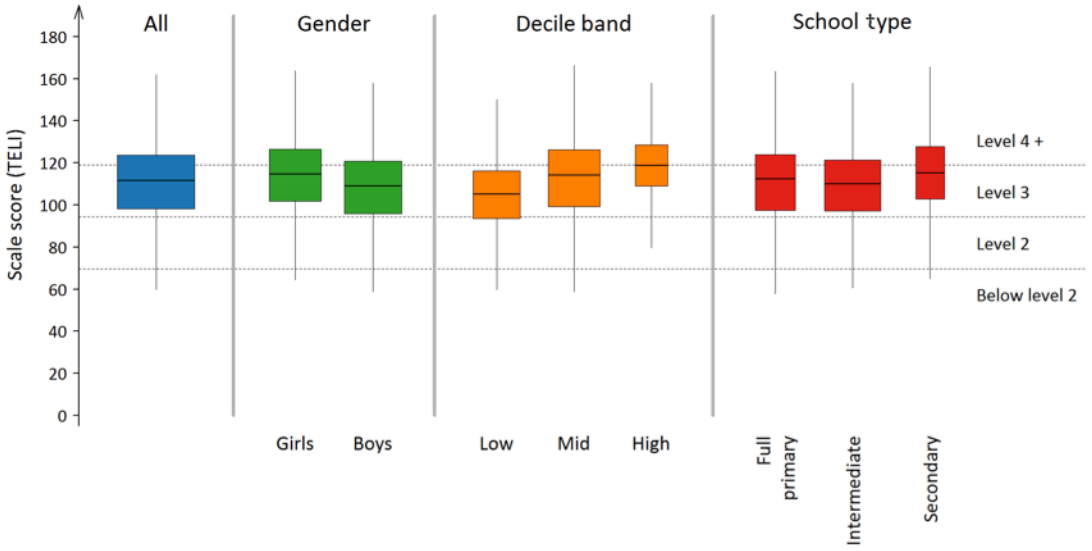


Figure 5.4 Distribution of scores for Year 8 Māori students on the TELI scale, by gender, school decile band and school type

The average TELI score for Māori girls was 9 TELI units higher than Māori boys at Year 4 and 6 TELI units at Year 8. The differences were statistically significant and at Year 4, are roughly equivalent to the amount of progress associated with about one year of instruction.

At Year 4, Māori students from high and mid decile schools scored, on average, higher than Māori students from low decile schools by 18 and 13 TELI units, respectively. The figures at Year 8 were 14 and 8 TELI units, respectively. The differences between high and low decile schools were roughly equivalent to the amount of progress associated with one and a half years of instruction.

There were no differences between the average scores on the TELI assessment for Māori students from different school types.

Difference in achievement between Year 4 and Year 8 for Māori students

Figure 5.5 shows the distribution of scores on the TELI assessment for all Year 4 and Year 8 Māori students. As can be seen, there was a degree of overlap between the distributions; some Year 4 Māori students achieved at a similar level as some Māori students in Year 8 and vice versa. At both year levels, achievement ranged mainly over three curriculum levels.

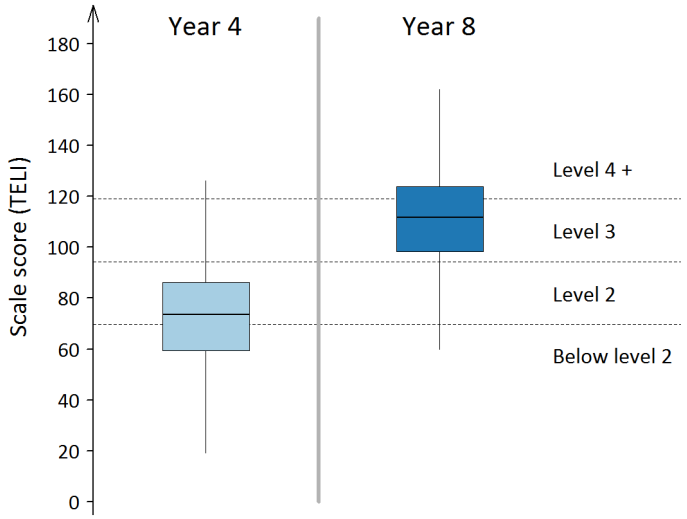


Figure 5.5 Distribution of scores for Māori students on the TELI scale, by year level

On average, Māori students at Year 8 scored higher than Māori students at Year 4 by 40 scale TELI units. The corresponding difference for the national sample was 38 units. The difference for Māori students represents an annualised progress of 10 TELI units and an effect size of 0.50. For each year of instruction, Māori students made about 10 TELI units progress; the same as the national sample. The difference in average scores between Year 4 and Year 8 Māori students was similar by gender and school decile groups.

Māori students' attitudes to technology

Figure 5.6 shows that, as for the national sample, about 75 percent of Māori students were positive or very positive about technology. Year 4 Māori students scored, on average, 3 ATT scale units higher than Year 8 Māori students. While the difference was statistically significant, the effect size was small (.17).

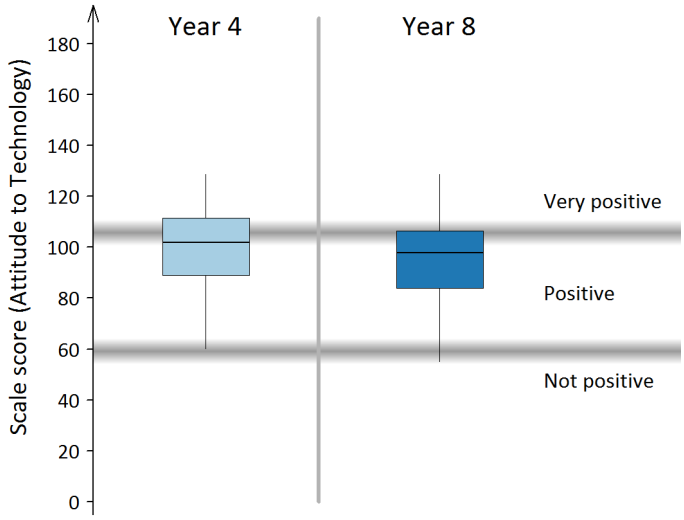


Figure 5.6 Distribution of scores for Māori students on the ATT scale, by year level

2. Pasifika students

Pasifika students participating in the study

Table 5.3 shows the number of Pasifika students in the national samples who participated in the technology study at each year level, by gender and school decile band. Pasifika students represented 13 percent of the national samples. There were more Pasifika boys than girls in the sample at Year 4 but not at Year 8. Over 60 percent of the Pasifika students in the samples, were from low decile schools (Year 4: 61 percent, Year 8: 65 percent).

Table 5.3 Composition of the Pasifika samples for the 2016 NMSSA tecnology study

	Number of Pasifika students	
	Year 4 *N = 301*	Year 8 *N = 306*
Gender		
Girls	143	164
Boys	158	142
School decile band		
Low	183	198
Mid	83	69
High	35	39

Achievement for Pasifika students

Pasifika student achievement against the curriculum

Figures 5.7 and 5.8 use line graphs to show the score distribution for Pasifika students in Year 4 and Year 8, respectively, against the agreed alignment of curriculum levels 2, 3 and 4 with the TELI scale. The score distributions for all students in the national samples are also provided as a reference.

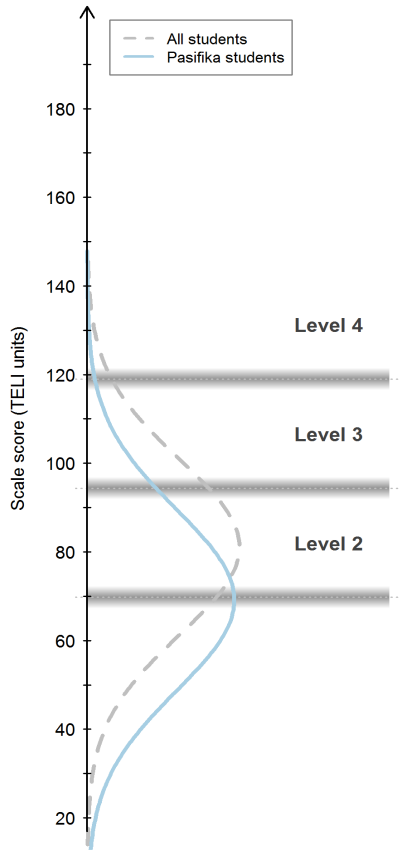


Figure 5.7 Distribution of scores for Year 4 Pasifika students on the TELI scale against the NZC levels for technology

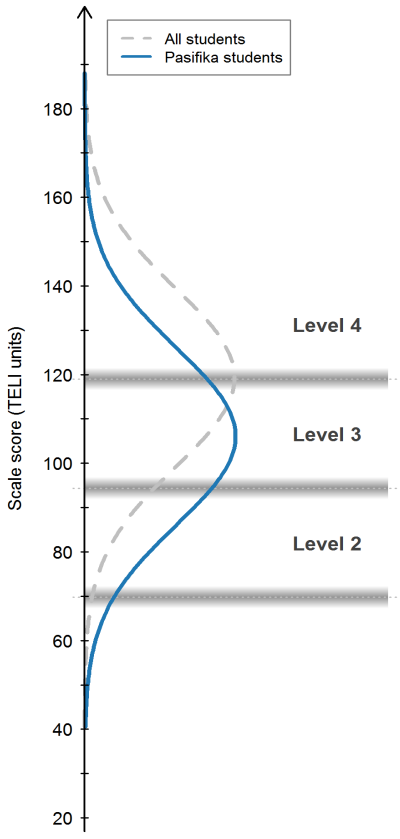


Figure 5.8 Distribution of scores for Year 8 Pasifika students on the TELI scale against the NZC levels for technology

Table 5.4 shows the percentages of Year 4 and Year 8 Pasifika students achieving against curriculum levels according to the TELI scale. Fifty-one percent of Year 4 students scored above the minimum score on the TELI scale associated with achieving curriculum level 2 objectives. Twenty-six percent of Year 8 students scored above the minimum score associated with achieving curriculum level 4 objectives.

Table 5.4 Percentage of Year 4 and Year 8 Pasifika students achieving across curriculum levels according to the TELI scale

	Year 4		Year 8	
Curriculum level	%	Confidence interval (%)	%	Confidence interval (%)
Level 4 and above	0	(-0.5, 1.0)	26	(20.5, 32.5)
Level 3	9	(5.5, 13.0)	46	(39.5, 53.0)
Level 2	42	(35.0, 48.0)	24	(18.0, 29.0)
Level 1	49	(42.0, 55.5)	4	(1.5, 6.5)

Achievement for Pasifika students by gender, school decile band and school type

Figures 5.9 and 5.10 use box plots to compare the distributions on the TELI assessment for Pasifika students by gender, school decile band and type of school in Year 4 and Year 8, respectively.

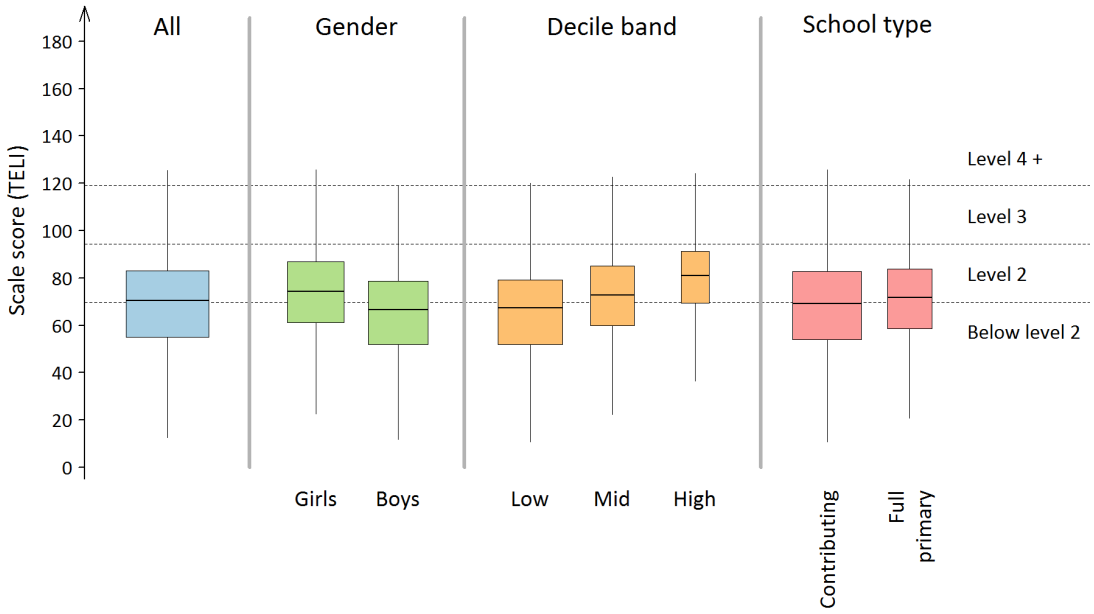


Figure 5.9 Distribution of scores for Year 4 Pasifika students on the TELI scale, by gender, school decile band and school type[17]

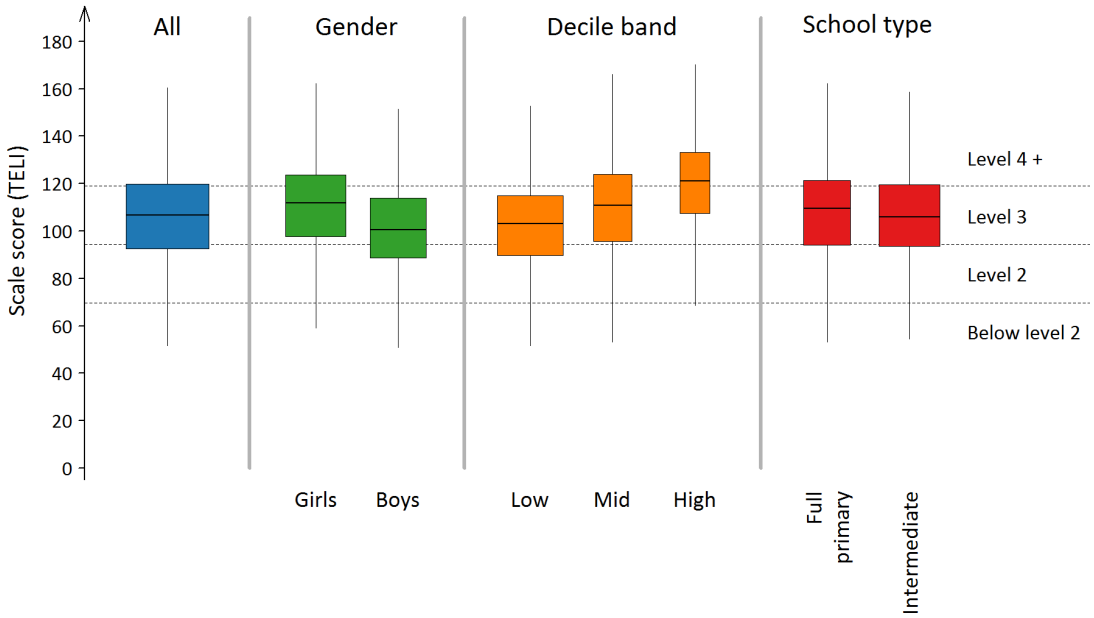


Figure 5.10 Distribution of scores for Year 8 Pasifika students on the TELI scale, by gender, school decile band and school type[18]

[17] there were too few Pasifika students to report results for Composite Schools (Year 1-15) at Year 4 (n=4)

[18] there were too few Pasifika students to report results for Composite Schools (Year 1-15) (n=17) and Secondary schools (Year 9–15) (n=12) at Year 8.

At both year levels, Pasifika girls scored, on average, higher than Pasifika boys by 9–10 TELI units which is roughly equivalent to the amount of progress associated with about one year of instruction. At Year 4 and Year 8, Pasifika students from high decile schools scored, on average, higher than Pasifika students from low decile schools by 14 and 18 TELI units, respectively. The differences between students from high and low decile schools were roughly equivalent to the amount of progress associated with one and a half years of instruction. There was no difference between the average TELI scale scores by type of school.

Difference in achievement between Year 4 and Year 8 for Pasifika students

Figure 5.11 shows the distribution of scores on the TELI assessment for all Year 4 and Year 8 Pasifika students, respectively.

On average, Year 8 Pasifika students scored higher than Year 4 Pasifika students by 36 TELI units. The corresponding difference for the national sample was 38 units. The Pasifika difference represents an annualised progress of 9 TELI units and an effect size of 0.46. For each year of instruction, Pasifika students make about 9 TELI units progress. The difference between Year 4 and Year 8 Pasifika students was similar by gender and school decile groups.

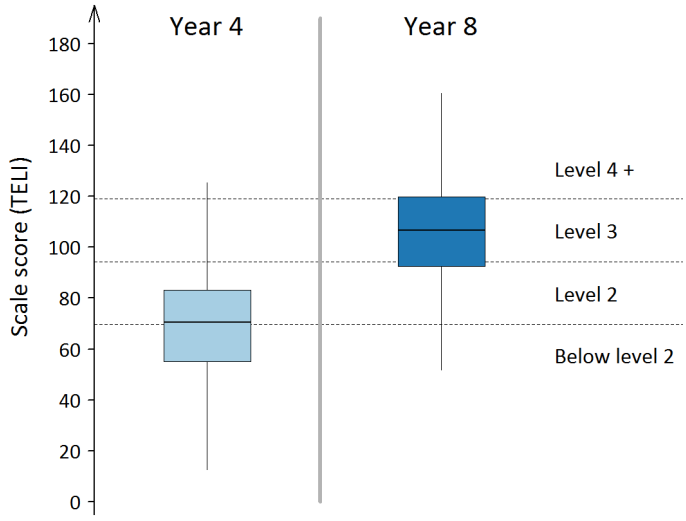


Figure 5.11 Distribution of scores for Pasifika students on the TELI scale, by year level

Pasifika students' attitudes to technology

Figure 5.12 shows that, as for the national sample, about 75 percent of Pasifika students were positive or very positive about technology. There was no difference, on average, between Year 4 and Year 8 students on the ATT scale.

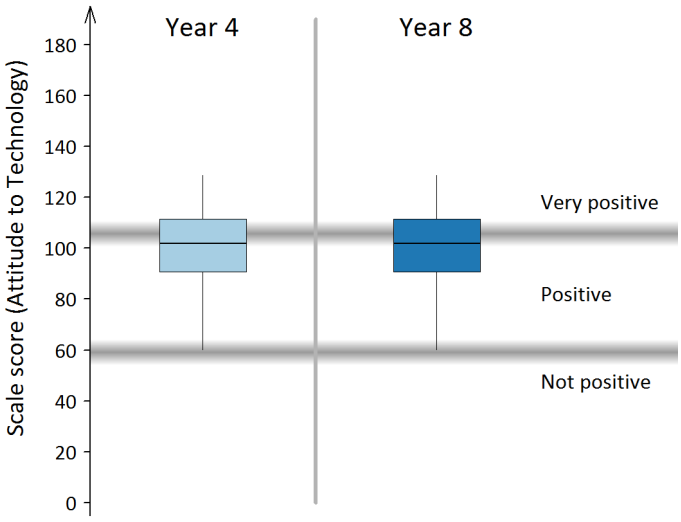


Figure 5.12 Distribution of scores for Pasifika students on the ATT scale, by year level

3. Students with special education needs

Students with special education needs participating in the study

Participating schools identified students' special education needs[19] using the following categories:

- High special education needs: for example, ORS funded, severe behaviour or receiving communication assistance from Special Education
- Moderate special education needs: for example, provided with a teacher aide from school funds, on the case load for Resource Teachers: Learning and Behaviour (RTLB), or Child Youth and Family Services (CYFS)
- On referral: for example, referred to Special Education or CYFS with action pending.

Students with special education needs were encouraged to participate in the study using the level of assistance normally provided to them in school. The NMSSA project team also prepared accommodations, such as larger print booklets, when these were requested.

Schools were able to withdraw any students for whom they believed participating in the study would be inappropriate. Parents were also able to withdraw students from participating in the study. Reasons for withdrawing students were not always related to students having special education needs, but could also include, for example, students who had less than one year's experience with English, or whose parents did not wish their child to be out of the classroom.

When schools returned the list of their Year 4 or Year 8 student cohort, 177 Year 4 students and 173 Year 8 students were identified as having special education needs and it would be inappropriate for them to take part in the study. The list of randomly selected students was returned to each school, along with letters of information for parents. The number of students with special education needs withdrawn, by special education needs category, at this point, is summarised in Table 5.5.

Table 5.5 Number of students with special education needs withdrawn from the selected samples of Year 4 and Year 8 students by special education needs category

	Number of students	
Category	Year 4	Year 8
High/very high special education needs	9	26
Moderate special education needs	11	4
On referral	9	8
Total	**29**	**38**

Table 5.6 shows the number of students who were included in the study according to special education needs categories. The 'on referral' and 'high special education needs' groups were very small at each year level and cannot be considered nationally representative. Overall, 8 percent of students at Year 4 and 6 percent of students in Year 8 were included in either the high needs, moderate needs or on-referral categories. Findings are presented for the special education needs categories combined. There was a greater percentage of boys than girls at both year levels (Year 4: 62 percent, Year 8: 70 percent).

Table 5.6 Number of Year 4 and Year 8 students with special education needs, by category

	Number of students with special education needs	
Category	Year 4	Year 8
High special education needs	5	10
Moderate special education needs	165	97
On referral	20	21
Combined special education needs	**190**	**128**

[19] The categories of special education needs were those commonly used in schools and therefore easy for schools to respond to. Schools were asked to describe the funding supports in place for children with special education needs to access the curriculum, through ORS, RTLB, MoE specialist staff and school funds. To capture any unmet needs, they were also asked to note students who were on referral to MoE specialist staff, RTLB, etc. These categories were discussed and endorsed by the NMSSA special education needs reference group.

Achievement for students with special education needs

Achievement against the curriculum for students with special education needs

Table 5.7 shows percentages of Year 4 and Year 8 students with special education needs achieving against curriculum levels according to the TELI scale. Fifty-seven percent of Year 4 students scored above the minimum score on the TELI scale associated with achieving curriculum level 2 objectives. Twenty-one percent of Year 8 students scored above the minimum score associated with achieving curriculum level 4 objectives.

Table 5.7 Percentage of Year 4 and Year 8 students with special education needs achieving across curriculum levels according to the Technological Literacy scale, by curriculum level

	Year 4		Year 8	
Curriculum level	%	Confidence interval (%)	%	Confidence interval (%)
Level 4 and above	1	(-0.5, 2.0)	21	(12.5, 29.5)
Level 3	12	(7.0, 18.5)	43	(32.5, 53.0)
Level 2	44	(35.5, 52.5)	29	(19.5, 38.5)
Level 1	43	(34.5, 51.5)	7	(1.5, 12.5)

Achievement by year level and gender

Figures 5.13 and 5.14 use box plots to show the distributions of scores on the TELI scale for all students with special education needs and by gender at Year 4 and Year 8, respectively.

On average, Year 8 students with special education needs scored higher than Year 4 students by 28 TELI units, compared with a difference of 38 TELI units for the national sample. This difference represents an annualised progress of 7 TELI units and an effect size of 0.35. This amount of progress was lower than for the national sample: 10 TELI units. This indicates that, overall, for students with special education needs, there was less progress than for all students in the national sample. The difference between Year 4 and Year 8 students was similar by gender and school decile groups.

On average, boys and girls scored the same at each year level.

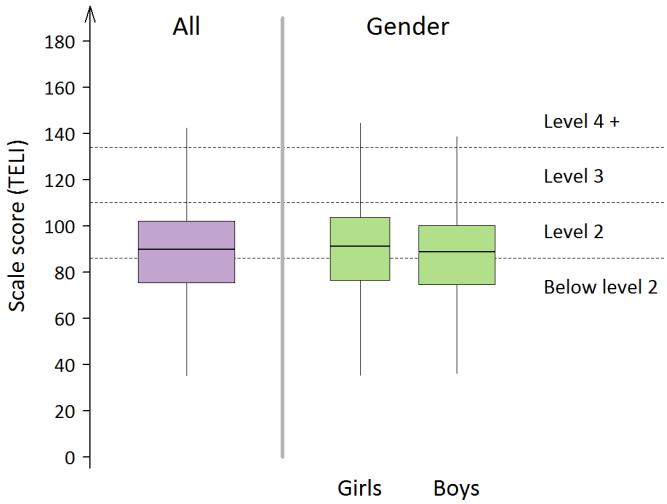


Figure 5.13 Distribution of scores for all Year 4 students with special education needs on the TELI scale and by gender

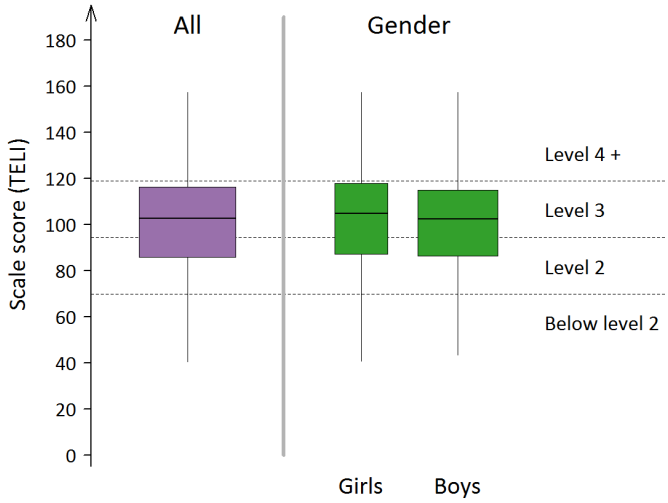


Figure 5.14 Distribution of scores for all Year 8 students with special education needs on the TELI scale and by gender

Differences in the achievement of students with special education needs by school decile

There was a statistically significant difference between the average scores of students with special education needs on the TELI assessment at both year levels for school decile. At Year 4, students from high and mid decile schools scored, on average, higher than students from low decile schools by 20 and 15 TELI units, respectively. The figures at Year 8 were 22 and 15 TELI units, respectively. At both year levels, the differences between high and low decile schools were roughly equivalent to the amount of progress associated with two years of instruction.

Attitudes to technology for students with special education needs

Figure 5.15 shows that almost all students with special education needs were positive or very positive about technology. There was no difference, on average, between Year 4 and Year 8 students on the ATT scale.

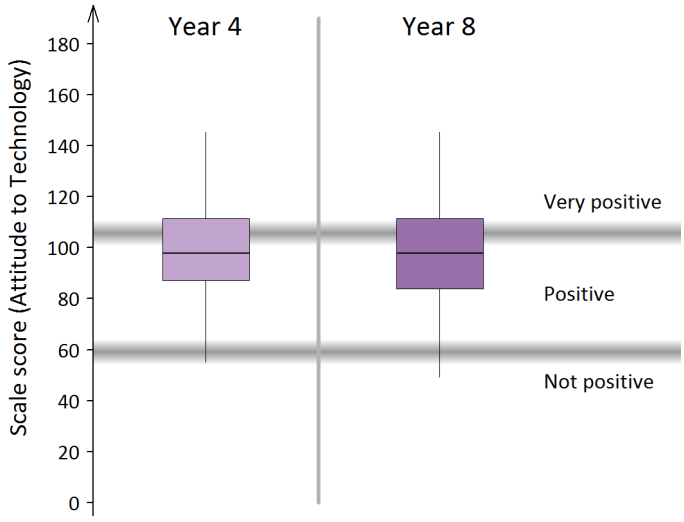


Figure 5.15 Distribution of scores for students with special education needs on the ATT scale, by year level

4. Benchmarking success for priority learners

Tables 5.8 and 5.9 display summary statistics for Year 4 and Year 8 students, respectively, who scored above the national average for their year level on the TELI assessment. The statistics are provided for each priority learner group and for all students in the national sample. The national average at each year level has been used as a benchmark for comparison purposes.

Just over 50 percent of Year 4 and Year 8 students scored at or above the respective national averages. At each year level the proportion of priority learner groups achieving at or above the respective national averages were lower. The average TELI scale scores for students achieving above the benchmark score was lower for students from the priority learner groups compared with students from the all students group.

Generally a greater percentage of girls than boys achieved at or above the benchmark, as did students from high decile schools, then mid decile schools. There were no differences for school type.

Table 5.8 Summary statistics for Year 4 students scoring above the Year 4 average score benchmark, by group

Technological Literacy (TELI)					
Group	Percentage at or above benchmark (%)	Confidence interval (%)	Average score (TELI units)	Confidence interval (TELI units)	Standard deviation (TELI units)
Māori	35	(30.0, 39.0)	93	(92.0, 94.0)	9
Pasifika	29	(23.0, 35.5)	93	(91.5, 94.5)	10
Special education needs	34	(25.5, 41.5)	94	(92.5, 95.5)	10
All students	52	(49.5, 54.5)	96	(95.5, 96.5)	11

Table 5.9 Summary statistics for Year 8 students scoring above the Year 8 average score benchmark, by group

Technological Literacy (TELI)					
Group	Percentage at or above benchmark (%)	Confidence interval (%)	Average score (TELI units)	Confidence interval (TELI units)	Standard deviation (TELI units)
Māori	34	(29.0, 38.5)	131	(130.0, 132.0)	9
Pasifika	26	(20.5, 32.0)	130	(128.5, 131.5)	10
Special education needs	21	(12.5, 29.5)	129	(127.5, 130.5)	8
All students	52	(49.0, 54.0)	135	(134.5, 135.5)	11

5. Summary

The percentages of Year 4 and Year 8 students of priority learner groups who scored above the minimum score on the TELI scale associated with achieving curriculum level 2 and 4 objectives, respectively, are summarised in Table 5.10.

Table 5.10 Percentage of Year 4 and Year 8 students from each priority learner group who achieved above the minimum scores on the TELI scale associated with achieving curriculum level 2 and level 4, respectively

	Percent of students for each priority learner group		
Year level and curriculum level	Māori students	Pasifika students	Students with special education needs
Year 4, level 2 and above	57	51	57
Year 8, level 4 and above	34	26	21

At both year levels, the pattern of differences on the TELI scale scores for gender and school decile for students who were Māori and Pasifika was similar to the national sample. Girls scored higher than boys with a difference that was roughly equivalent to the amount of progress associated with about one year of instruction. Students from high decile schools scored higher than students from low decile schools with a difference that was roughly equivalent to the amount of progress associated with one and a half years of instruction.

As expected, the average TELI score for Year 8 students in the priority learner groups was significantly different from their respective groups of Year 4 students. For Māori and Pasifika students, the difference was similar to the national sample. For students with special education needs, the difference was less.

Contextual factors associated with learning in technology

Māori, Pasifika and students with special education needs showed similar levels of positive attitudes to technology as the national sample at both year levels.

Benchmarking success for priority learners

The national average at each year level was used as a benchmark for comparison purposes. Lower percentages of students from the priority learner groups scored at or above the respective national averages than the national samples. The average TELI scale scores for students achieving above the benchmark score was lower for students from the priority learner groups compared with all students in the national sample.

Appendix: Summary Statistics

Tables:

Note:

The tables present an 'actual sample size' and an 'effective sample size'. The latter makes an adjustment to the calculation of statistics because of the way the study is designed. That is, schools are sampled and then students are sampled from within those schools. See Appendix 3 of the *Technical Information 2016* report for an explanation of the procedure used.

Table A1.1 Summary of achievement and contextual data collected from students, teachers and principals

	Year 4	Year 8
	N	*N*
Number of schools	100	100
Students		
Number of students completing TELI assessment	2337	2284
Number of students completing questionnaire	2319	2265
Teachers and principals		
Number of teachers completing questionnaire	231	270
Number of principals completing questionnaire	91	91

The student samples for each assessment component and the questionnaire are considered to be nationally

National samples

Table A1.2 Achievement on the TELI scale: Summary statistics for Year 4 students

Group	Actual sample size	Effective sample size	Mean	Confidence interval for the mean	Standard deviation
All	2337	1636	81	(80.0, 82.0)	20
Gender					
Girls	1146	802	84	(82.5, 85.5)	19
Boys	1191	834	78	(77.0, 79.5)	20
Ethnicity					
Māori	570	399	72	(70.5, 74.5)	19
Non-Māori	1767	1237	84	(83.0, 85.0)	19
Pasifika	301	211	69	(66.5, 72.0)	21
Non-Pasifika	2036	1425	83	(82.0, 84.0)	19
Asian	203	142	82	(79.5, 85.5)	19
Non-Asian	2134	1494	81	(80.0, 82.0)	20
NZE	1484	1039	86	(84.5, 87.0)	18
Non-NZE	853	597	73	(71.5, 74.5)	20
Decile band					
Low decile	450	315	67	(65.0, 69.5)	20
Mid decile	1012	708	82	(80.5, 83.0)	18
High decile	875	612	87	(86.0, 89.0)	18
School type					
Contributing school	1535	1074	81	(79.5, 81.5)	20
Full primary school	758	531	82	(80.5, 84.0)	20
Composite school (Year 1-15)	44	31	81	(75.0, 87.5)	18
Special education needs					
SEN (combined)	190	133	72	(69.0, 76.0)	20
No SEN	2147	1503	82	(81.0, 83.0)	20

Table A1.3 Achievement on the TELI scale: Summary statistics for Year 8 students

Group	Actual sample size	Effective sample size	Mean	Confidence interval for the mean	Standard deviation
All	2284	1599	119	(118.5, 120.5)	20
Gender					
Girls	1130	791	123	(121.5, 124.0)	20
Boys	1154	808	116	(114.5, 117.5)	20
Ethnicity					
Māori	514	360	111	(109.0, 112.5)	19
Non-Māori	1770	1239	122	(120.5, 123.0)	20
Pasifika	306	214	106	(103.5, 109.0)	20
Non-Pasifika	1978	1385	121	(120.5, 122.5)	19
Asian	230	161	121	(117.5, 123.5)	19
Non-Asian	2054	1438	119	(118.0, 120.0)	20
NZE	1428	1000	124	(122.5, 125.0)	19
Non-NZE	856	599	112	(110.5, 113.5)	20
Decile band					
Low decile	496	347	106	(104.0, 108.5)	20
Mid decile	886	620	120	(118.5, 121.5)	19
High decile	902	631	126	(124.5, 127.0)	18
School type					
Full primary school	743	520	120	(118.0, 121.5)	20
Intermediate school	1049	734	118	(116.5, 119.5)	20
Composite school (Year 1-15)	120	84	120	(115.0, 125.5)	24
Secondary school (Year 7-15)	320	224	121	(119.0, 124.0)	19
Restricted composite school (Year 7-10)	52	36	124	(119.0, 130.0)	16
Special education needs					
SEN (combined)	128	90	101	(97.0, 105.5)	21
No SEN	2153	1507	120	(119.5, 121.5)	20

Table A1.4 Differences between subgroup means for Year 4 students

Subgroup 1	Effective sample size subgroup 1	Subgroup 2	Effective sample size subgroup 2	Difference in means*	CI for the difference in means	Effect size
Gender						
Girls	802	Boys	834	**6**	(4.0, 7.5)	0.29
Ethnicity						
Māori	399	Non-Māori	1237	**-11**	(-13.5, -9.5)	-0.60
Pasifika	211	Non-Pasifika	1425	**-14**	(-16.5, -11.0)	-0.71
Asian	142	Non-Asian	1494	2	(-2.0, 5.0)	0.08
NZE	1039	Non-NZE	597	**13**	(10.5, 14.5)	0.67
Decile band						
High decile	612	Mid decile	708	**5**	(3.5, 7.5)	0.30
High decile	612	Low decile	315	**20**	(17.5, 23.0)	1.07
Mid decile	708	Low decile	315	**15**	(12.0, 17.5)	0.78
School type**						
Contributing	1074	Full primary	531	-2	(-4.0, 0.5)	-0.09
Special education needs						
No SEN	1503	SEN (combined)	133	**10**	(6.0, 13.0)	0.49

* Differences in means in bold font are statistically significant
** Composite (Yr 1-15) schools comparisons excluded, N=31

Table A1.5 Differences between subgroup means for Year 8 students

Subgroup 1	Effective sample size subgroup 1	Subgroup 2	Effective sample size subgroup 2	Difference in means*	CI for the difference in means	Effect size
Gender						
Girls	791	Boys	808	**7**	(5.0, 9.0)	0.35
Ethnicity						
Māori	360	Non-Māori	1239	**-11**	(-13.5, -9.0)	-0.56
Pasifika	214	Non-Pasifika	1385	**-15**	(-18.0, -12.5)	-0.78
Asian	161	Non-Asian	1438	1	(-1.5, 4.5)	0.07
NZE	1000	Non-NZE	599	**12**	(10.0, 14.0)	0.61
Decile band						
High decile	631	Mid decile	620	**6**	(3.5, 8.0)	0.31
High decile	631	Low decile	347	**20**	(17.0, 22.0)	1.06
Mid decile	620	Low decile	347	**14**	(11.5, 16.5)	0.72
School type**						
Full primary	520	Intermediate	734	2	(-1.0, 4.0)	0.07
Full primary	520	Secondary (Yr7-15)	224	-2	(-4.5, 1.5)	-0.08
Intermediate	734	Secondary (Yr 7-15)	224	**-3**	(-6.0, -0.5)	-0.16
Special education needs						
No SEN	1507	SEN (combined)	90	**19**	(14.5, 23.5)	0.97

* Differences in means in bold font are statistically significant
** Restricted composite (Year 7-10) and Composite (Year 1-15) comparisons excluded, N=36 and 84, respectively

Table A1.6 Differences between means on TELI for Year 4 and Year 8 by subgroup

Group	Year 8 effective sample size	Year 4 effective sample size	Year 8–Year 4 difference in means	CI for difference in means	Effect size
All	1599	1636	38	(37.0, 39.5)	1.91
Gender					
Girls	791	802	39	(37.0, 40.5)	1.98
Boys	808	834	38	(35.5, 39.5)	1.89
Ethnicity					
Māori	360	399	38	(35.5, 41.0)	2.00
Pasifika	214	211	37	(33.0, 41.0)	1.82
Asian	161	142	38	(34.0, 42.5)	2.00
NZE	1000	1039	38	(36.5, 39.5)	2.07
Decile band					
Low decile	347	315	39	(36.0, 42.0)	1.95
Mid decile	620	708	38	(36.0, 40.0)	2.05
High decile	631	612	38	(36.5, 40.5)	2.15
Special education needs					
SEN (combined)	90	133	29	(23.5, 34.5)	1.41

Table A1.7 Technological Literacy (TELI score units): Curriculum levels for Year 4 students

Group	Sample size	Percentage of students at <L2	Confidence interval for <L2 percentage	Percentage of students at L2	Confidence interval for L2 percentage	Percentage of students at L3	Confidence interval for L3 percentage	Percentage of students at L4+	Confidence interval for L4+ percentage
All	2337	27	(24.5, 29.0)	48	(45.5, 50.5)	23	(21.5, 25.5)	2	(1.5, 2.5)
Gender									
Girls	1146	22	(19.0, 25.0)	48	(44.5, 51.5)	27	(24.0, 30.0)	3	(1.5, 4.0)
Boys	1191	31	(28.0, 34.0)	48	(44.5, 51.0)	20	(17.5, 22.5)	1	(0.5, 2.0)
Ethnicity									
Māori	570	43	(38.0, 47.5)	45	(40.0, 49.5)	12	(9.0, 15.5)	34	(29.5, 39.0)
Pasifika	301	49	(42.0, 55.5)	42	(35.0, 48.0)	9	(5.5, 13.0)	26	(20.5, 32.5)
Asian	203	24	(17.0, 31.0)	48	(40.0, 56.5)	26	(19.0, 33.0)	56	(48.0, 63.5)
NZE	1484	18	(15.5, 20.0)	50	(47.0, 53.0)	29	(26.5, 32.0)	61	(58.5, 64.5)
Non-Māori	1767	21	(19.0, 23.5)	49	(46.0, 51.5)	27	(24.5, 29.5)	58	(55.0, 60.5)
Non-Pasifika	2036	23	(21.0, 25.5)	49	(46.5, 51.5)	26	(23.5, 28.0)	57	(54.0, 59.5)
Non-Asian	2134	27	(24.5, 29.0)	48	(45.5, 50.5)	23	(21.0, 25.5)	52	(49.5, 55.0)
Non-NZE	853	42	(38.0, 46.0)	44	(40.0, 48.0)	13	(10.5, 16.0)	38	(34.0, 41.5)
Decile band									
Low decile	450	54	(48.5, 59.5)	37	(31.5, 42.0)	9	(5.5, 12.0)	26	(21.0, 30.0)
Mid decile	1012	23	(20.5, 26.5)	52	(48.5, 56.0)	22	(19.5, 25.5)	54	(50.5, 58.0)
High decile	875	16	(13.0, 19.0)	48	(44.5, 52.5)	32	(28.5, 36.0)	66	(62.0, 69.5)
School type									
Contributing school	1535	28	(25.0, 30.0)	48	(45.0, 51.0)	23	(20.0, 25.0)	2	(1.0, 2.5)
Full primary school	758	25	(21.0, 28.5)	48	(43.5, 52.0)	25	(21.5, 29.0)	2	(1.0, 3.5)
Composite school	44	25	(9.5, 40.5)	50	(32.5, 67.5)	23	(8.0, 37.5)	2	(-3.0, 7.5)
Special education needs									
SEN (combined)	190	43	(34.5, 51.5)	44	(35.5, 52.5)	13	(7.0, 18.5)	1	(-0.5, 2.0)
No SEN	2147	25	(23.0, 27.5)	48	(45.5, 51.0)	24	(22.0, 26.5)	2	(1.5, 3.0)

Table A1.8 Technological Literacy (TELI score units): Curriculum levels for Year 8 students

Group	Sample size	Percentage of students at <L2	Confidence interval for <L2 percentage	Percentage of students at L2	Confidence interval for L2 percentage	Percentage of students at L3	Confidence interval for L3 percentage	Percentage of students at L4+	Confidence interval for L4+ percentage
All	2284	1	(0.5, 1.5)	10	(8.5, 11.5)	36	(34.0, 38.5)	53	(50.0, 55.0)
Gender									
Girls	1130	1	(0.0, 1.0)	7	(5.5, 9.0)	33	(29.5, 36.0)	59	(56.0, 62.5)
Boys	1154	2	(1.0, 2.5)	12	(10.0, 15.0)	40	(36.5, 43.0)	46	(42.5, 49.5)
Ethnicity									
Māori	514	2	(0.5, 3.5)	17	(13.0, 21.0)	47	(41.5, 52.0)	34	(29.5, 39.0)
Pasifika	306	4	(1.5, 6.5)	24	(18.0, 29.0)	46	(39.5, 53.0)	26	(20.5, 32.5)
Asian	230	1	(-0.5, 2.5)	7	(3.5, 11.5)	36	(28.5, 43.5)	56	(48.0, 63.5)
NZE	1428	0	(0.0, 1.0)	6	(4.5, 7.5)	32	(29.5, 35.0)	61	(58.5, 64.5)
Non-Māori	1770	1	(0.5, 1.5)	8	(6.5, 9.5)	33	(30.5, 36.0)	58	(55.0, 60.5)
Non-Pasifika	1978	1	(0.5, 1.0)	8	(6.5, 9.0)	35	(32.5, 37.5)	57	(54.0, 59.5)
Non-Asian	2054	1	(0.5, 2.0)	10	(8.5, 11.5)	36	(34.0, 39.0)	52	(49.5, 55.0)
Non-NZE	856	2	(1.0, 3.5)	17	(13.5, 19.5)	43	(39.0, 47.0)	38	(34.0, 41.5)
Decile band									
Low decile	496	4	(2.0, 6.0)	22	(18.0, 27.0)	48	(42.5, 53.0)	26	(21.0, 30.0)
Mid decile	886	1	(-0.0, 1.0)	9	(7.0, 11.5)	36	(32.0, 39.5)	54	(50.5, 58.0)
High decile	902	0	(-0.0, 1.0)	4	(2.0, 5.0)	30	(26.5, 34.0)	66	(62.0, 69.5)
School type									
Full primary	743	1	(0.0, 2.0)	10	(7.5, 13.0)	35	(31.0, 39.0)	54	(49.5, 58.0)
Intermediate	1049	1	(0.5, 2.0)	11	(8.5, 13.0)	39	(35.0, 42.0)	50	(46.0, 53.0)
Composite (Yrs 1-15)	120	2	(-1.0, 6.0)	12	(5.0, 18.5)	30	(20.0, 40.0)	56	(45.0, 66.5)
Restricted composite (Yrs 7-10)	52	0	(0.0, 0.0)	2	(-2.5, 6.5)	35	(19.0, 50.0)	63	(48.0, 79.0)
Secondary (Yrs 7-15)	320	1	(-0.5, 2.0)	8	(4.0, 11.0)	34	(27.5, 40.0)	58	(51.5, 64.5)
Special education needs									
SEN (combined)	128	7	(1.5, 12.5)	29	(19.5, 38.5)	43	(32.5, 53.0)	21	(12.5, 29.5)
No SEN	2153	1	(0.5, 1.0)	9	(7.5, 10.0)	36	(33.5, 38.5)	55	(52.0, 57.0)

Māori samples

Table A1.9 Achievement on the TELI scale: Summary statistics for Year 4 Māori students

Group	Actual sample size	Effective sample size	Mean	Confidence interval for the mean	Standard deviation
All	570	399	72	(70.5, 74.5)	19
Gender					
Girls	270	189	77	(74.0, 79.5)	19
Boys	300	210	68	(66.0, 71.0)	19
Decile band					
Low decile	208	146	64	(60.5, 67.0)	19
Mid decile	247	173	76	(73.5, 78.5)	17
High decile	115	80	81	(77.0, 84.5)	18
School type					
Contributing school	380	266	72	(70.0, 74.5)	19
Full primary school	179	125	73	(69.5, 76.5)	20
Composite school (Year 1-15)	11	8	73	(62.5, 83.0)	15

Table A1.10 Achievement on the TELI scale: Summary statistics for Year 8 Māori students

Group	Actual sample size	Effective sample size	Mean	Confidence interval for the mean	Standard deviation
All	514	360	111	(109.0, 112.5)	19
Gender					
Girls	230	161	114	(111.0, 116.5)	18
Boys	284	199	108	(105.5, 111.0)	19
Decile band					
Low decile	193	135	105	(101.5, 108.0)	18
Mid decile	232	162	113	(110.0, 115.5)	19
High decile	89	62	119	(114.5, 122.5)	16
School type					
Full primary school	141	99	110	(106.5, 114.5)	20
Composite school (Year 1-15)	19	13	116	(107.0, 125.0)	17
Intermediate school	274	192	109	(107.0, 112.0)	18
Restricted composite school (Year 7-10)	10	7	119	(106.5, 131.5)	17
Secondary school (Year 7-15)	70	49	115	(109.5, 120.0)	19

Table A1.11 Differences between subgroup means for Year 4 Māori students

Subgroup 1	Effective sample size subgroup 1	Subgroup 2	Effective sample size subgroup 2	Difference in means*	CI for the difference in means	Effect size
Gender						
Girls	189	Boys	210	**8**	(4.5, 12.0)	0.44
Decile band						
High decile	80	Mid decile	173	**5**	(0.0, 9.5)	0.27
High decile	80	Low decile	146	**17**	(12.0, 22.0)	0.90
Mid decile	173	Low decile	146	**12**	(8.0, 16.5)	0.67
School type**						
Contributing school	266	Full primary school	125	-1	(-4.5, 3.5)	-0.03

* Differences in means in bold font are statistically significant ** Composite (Yr 1-15) schools comparisons excluded, N=8

Table A1.12 Differences between subgroup means for Year 8 Māori students

Subgroup 1	Effective sample size subgroup 1	Subgroup 2	Effective sample size subgroup 2	Difference in means*	CI for the difference in means	Effect size
Gender						
Girls	161	Boys	199	**6**	(1.5, 9.5)	0.30
Decile band						
High decile	62	Mid decile	162	**6**	(1.0, 11.0)	0.32
High decile	62	Low decile	135	**14**	(9.0, 19.0)	0.79
Mid decile	162	Low decile	135	**8**	(4.0, 12.5)	0.43
School type**						
Full primary school	99	Intermediate school	192	1	(-4.0, 5.5)	0.05

* Differences in means in bold font are statistically significant
** Restricted composite, composite (Year 1-15) and secondary (Year 7-15) comparisons excluded, N=7, N=13, and N=49, respectively.

Table A1.13 Differences between means on TELI for Year 4 and Year 8 Māori by subgroup

Group	Year 8 effective sample size	Year 4 effective sample size	Year 8–Year 4 difference in means	CI for difference in means	Effect size
All	360	399	38	(35.5, 41.0)	2.00
Gender					
Girls	161	189	37	(33.0, 41.0)	1.98
Boys	199	210	40	(36.0, 43.5)	2.10
Decile band					
Low decile	135	146	41	(36.5, 45.5)	2.19
Mid decile	162	173	37	(33.0, 40.5)	2.03
High decile	62	80	38	(32.5, 43.5)	2.21

Pasifika samples

Table A1.14 Achievement on the TELI scale: Summary statistics for Year 4 Pasifika students

Group	Actual sample size	Effective sample size	Mean	Confidence interval for the mean	Standard deviation
All	301	211	69	(66.5, 72.0)	21
Gender					
Girls	143	100	74	(69.5, 77.5)	20
Boys	158	111	65	(61.5, 68.5)	20
Decile band					
Low decile	183	128	65	(62.0, 69.0)	21
Mid decile	83	58	73	(68.0, 77.5)	19
High decile	35	24	80	(72.5, 87.5)	19
School type					
Contributing school	208	146	68	(65.0, 72.0)	21
Full primary school	89	62	70	(65.5, 75.5)	20
Composite school (Year 1-15)	4	3	79	(60.5, 96.5)	15

Table A1.15 Achievement on the TELI scale: Summary statistics for Year 8 Pasifika students

Group	Actual sample size	Effective sample size	Mean	Confidence interval for the mean	Standard deviation
All	306	214	106	(103.5, 109.0)	20
Gender					
Girls	164	115	111	(107.0, 114.5)	20
Boys	142	99	101	(97.0, 104.5)	19
Decile band					
Low decile	198	139	102	(98.5, 105.0)	20
Mid decile	69	48	110	(105.0, 115.5)	18
High decile	39	27	120	(113.5, 127.0)	18
School type					
Full primary school	100	70	109	(104.0, 113.5)	20
Composite school (Year 1-15)	27	19	97	(87.0, 106.5)	21
Intermediate school	167	117	106	(102.0, 109.5)	20
Secondary school (Year 7-15)	12	8	110	(100.0, 120.0)	15

Table A1.16 Differences between subgroup means for Year 4 Pasifika students

Subgroup 1	Effective sample size subgroup 1	Subgroup 2	Effective sample size subgroup 2	Difference in means*	CI for the difference in means	Effect size
Gender						
Girls	100	Boys	111	**9**	(3.5, 14.0)	0.43
Decile band						
High decile	24	Mid decile	58	7	(-1.5, 16.0)	0.39
High decile	24	Low decile	128	**15**	(6.5, 22.5)	0.71
Mid decile	58	Low decile	128	**7**	(1.0, 13.0)	0.36
School type**						
Contributing school	146	Full primary school	62	-2	(-8.0, 4.0)	-0.09

* Differences in means in bold font are statistically significant
** Composite (Yr 1-15) schools comparisons excluded, N=3

Table A1.17 Differences between subgroup means for Year 8 Pasifika students

Subgroup 1	Effective sample size subgroup 1	Subgroup 2	Effective sample size subgroup 2	Difference in means*	CI for the difference in means	Effect size
Gender						
Girls	115	Boys	99	**10**	(5.0, 15.5)	0.52
Decile band						
High decile	27	Mid decile	48	**10**	(1.5, 18.5)	0.55
High decile	27	Low decile	139	**18**	(11.0, 26.0)	0.95
Mid decile	48	Low decile	139	**8**	(2.5, 14.5)	0.44
School type**						
Full primary school	70	Intermediate school	117	3	(-3.0, 9.0)	0.15

* Differences in means in bold font are statistically significant
** Secondary school (Year 7-15) comparisons excluded, N=8

Table A1.18 Differences between means on TELI for Year 4 and Year 8 Pasifika students by subgroup

Group	Year 8 effective sample size	Year 4 effective sample size	Year 8–Year 4 difference in means	CI for difference in means	Effect size
All	214	211	37	(33.0, 41.0)	1.82
Gender					
Girls	115	100	37	(32.0, 42.5)	1.87
Boys	99	111	36	(30.5, 41.0)	1.81
Decile band					
Low decile	139	128	36	(31.5, 41.0)	1.81
Mid decile	48	58	38	(30.5, 44.5)	2.03
High decile	27	24	40	(30.5, 50.0)	2.21

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Report 13

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