NMSSA • CYCLE 2

Wānangatia te Putanga Tauira
National Monitoring Study of Student Achievement

Technology 2021 – Key Findings

NMSSA
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National Monitoring Study of Student Achievement

CYCLE 2
NMSSA Report 26

NMSSA Report 26 : TECHNOLOGY 2021 – KEY FINDINGS

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National Monitoring Study of Student Achievement

Technology 2021

Key Findings

Educational Assessment Research Unit
and
New Zealand Council for Educational Research

NMSSA Report 26

Key reports for Technology 2021
(all available online at http://nmssa.otago.ac.nz/reports-and-resources)

26: Technology 2021 – Key Findings
27: Technical Information 2021

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- the Ministry of Education Research Team and Steering Committee.

Executive Summary

Introduction

The National Monitoring Study of Student Achievement (NMSSA) is a national sampling study designed to assess student achievement across the New Zealand Curriculum (NZC) at Year 4 and Year 8 in English-medium state and state integrated schools. The study is organised in five-year cycles, with all eight learning areas of the NZC monitored within this period. The first cycle ran from 2012 to 2016. The 2021 study represents the culmination of Cycle 2. As part of the 2021 study, NMSSA monitored achievement in the technology learning area. The study assessed achievement and also collected contextual data using questionnaires for students, teachers and principals. The last NMSSA study involving the technology learning area was in 2016.

This report is designed to provide a succinct overview of key findings related to technology from the 2021 study. The report is supplemented by a report focused on curriculum insights for teachers, a technical report, and an online interactive statistical application. All reports and the interactive application can be found on the NMSSA website.

Technology was introduced as a learning area in the NZC in 1995, and updated alongside all other learning areas in 2007. In 2017, the learning area of technology was revised to strengthen the positioning of digital technologies within the NZC. This change was substantial. It signalled the need for a greater focus on "students building their skills so they can be innovative creators of digital solutions, moving beyond solely being users and consumers of digital technologies".[1]

Interruption to the 2021 study

The 2021 NMSSA assessment programme was interrupted by a nationwide lockdown associated with COVID-19 that occurred midway through data collection in Term 3. This resulted in the entire programme being suspended for two and a half weeks. When the lockdown was over, NMSSA implemented a shortened programme in the schools that had not yet been visited and were still able to be involved. This did not include schools in Auckland where the lockdown continued. The interruption meant that the national sample for 2021 is made up of fewer students from a smaller number of schools than originally intended. In total, about 1,200 students were involved in the study at each year level. The students represented 61 schools at Year 4 and 64 schools at Year 8. This compares with the original intention to sample about 2,200 students from 100 schools at Year 4 and 100 schools at Year 8.

The interruption to the programme and the impact to the sample means that care should be taken when interpreting results, especially for smaller groups in the study. Given this, NMSSA has chosen to limit some aspects of the reporting, especially for smaller groups in the sample such as Pacific students. While the reporting does provide results for Pacific students, these are not used to draw inferences at a national level or to make comparisons with other groups.

General impact of COVID 19

It is also important to consider the more general impact of the COVID 19 pandemic when interpreting the results from the 2021 NMSSA study. In the 18 months leading up to the study, schools, students and whānau had to cope with a considerable amount of disruption, including extended periods of remote learning. Over this time, schools had to prioritise how they used time and put more effort into maintaining student wellbeing and providing pastoral care. Although NMSSA cannot directly quantify any learning losses associated with disruptions caused by COVID-19, it is likely that they have had at least some negative impacts.

[1] Te Kete Ipurangi (TKI) *https://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum/Technology*

The assessment programme for the technology learning area

In 2021, NMSSA assessed achievement in technology using a revised version of the Technological Literacy (TELI) assessment that was administered in the 2016 study. The revisions included material focused on the new digital technology areas. This material was both integrated into existing tasks, and incorporated within new tasks.

The changes to the TELI assessment mean that results from 2016 and 2021 cannot be compared using the same scale. To provide a sense of change over time, this report looks at how raw scores have changed on items that were used at both time points. Reporting is not provided against curriculum levels because of the relative newness of the digital technologies content, and the fact that the structure of the NZC is currently under review.

Information about the contextual factors associated with learning in technology was collected via questionnaires. In total, 803 students at Year 4 and 795 students at Year 8 completed a computer-based questionnaire related to learning in technology; up to 18 students in each school. Up to four teachers in each school completed a teacher questionnaire, with both classroom teachers and specialist technology teachers invited to participate. In total, 125 Year 4 teachers and 166 Year 8 teachers responded. Principals from 54 schools participating at Year 4 and 50 from schools participating at Year 8 completed a principal questionnaire.

Key findings

Achievement in technology

The difference between the average scores for Year 4 and Year 8 students on the 2021 TELI assessment was 32 TELI scale score units. This indicates that, on average, students make about 8 scale score units of 'progress' per year, between Year 4 and Year 8 and represents an annualised effect size of 0.4.

Girls scored higher, on average, than boys at both year levels[2]. The difference between the average scores for boys and girls was 5 scale score units at Year 4 and 7 units at Year 8.

Achievement varied within and across ethnic groups. Each ethnic group was made up of high and low achievers and, on average, the learners in each group made similar levels of 'progress' between Year 4 and Year 8. On average, students who identified as ākonga Māori scored lower than those who did not—by 12 scale score units at Year 4 and 14 units at Year 8. It is important to note that greater proportions of ākonga Māori, compared with non-Māori learners, attended lower decile schools and that achievement also varied with decile.

At both Year 4 and Year 8, students attending high decile[3] schools scored higher, on average than students who attended mid decile schools. Students in mid decile schools, in turn, achieved more highly than those attending low decile schools. The difference between students attending high and low deciles schools at Year 4 was 21 scale score units. At Year 8, it was 20 units.

An indication of how achievement has changed overtime can be provided by considering how scores have changed on assessment items that were used in both 2016 and 2021. At both year levels students, on average, scored lower on most of the common items in 2021 compared with students in 2016. The size of the changes varied from item to item, with the median change being a 4 percentage point decrease at Year 4 and a 6 percentage point decrease at Year 8.

Contextual factors associated with learning in technology

Use of specialist teachers in technology

The majority of Year 4 classroom teachers indicated that they had sole responsibility for teaching their students technology (81 percent). In comparison, 10 percent of Year 8 classroom teachers indicated that they had sole responsibility, with the majority indicating either shared responsibility (e.g. with a specialist teacher or an external provider) or no responsibility.

Consistent with this finding, a higher proportion of Year 8 teachers than Year 4 teachers indicated that they were employed as specialist teachers of technology (24 percent of Year 8 teachers and 3 percent of Year 4 teachers).

[2] Note that for the purposes of this study gender is binary and obtained via the National Student Number through the Ministry's ENROL database.

[3] 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.

Additionally, a higher proportion of principals from Year 8 schools indicated that their school provided technology teaching by technology specialists for students from other schools (38 percent of principals from Year 8 schools compared with 9 percent of principals from Year 4 schools). Results suggest that the two technological areas most often taught by specialist teachers at Year 8 are designing and developing materials outcomes (delivered by a specialist in 94 percent of schools) and designing and developing processed outcomes (delivered by a specialist in 88 percent of schools).

Specialist teachers of technology more frequently reported teaching the more established technological areas of designing and developing materials outcomes and designing and developing processed outcomes than classroom teachers. In contrast, classroom teachers more frequently reported teaching the two new digital areas than specialist teachers.

Attitude and confidence towards technology

Students at both year levels were generally positive about technology, with the majority of students selecting that they 'agree quite a lot' or 'totally agree' with statements such as 'I like learning about technology at school' and 'I think learning about technology is important'. On average, Year 4 students were more positive than Year 8 students. Overall, boys were more positive than girls.

Students were generally confident about their ability to use technological ideas and processes. Overall, boys reported a higher level of confidence.

Almost all teachers who responded to the questionnaire agreed that teaching technology was important. Results suggest that teachers felt more confident about teaching technology than about assessing technology. This was particularly pronounced at Year 4.

Teaching and learning in technology

Responses from Year 8 students indicate that in 2021, learning in technology involved working with a variety of technologies. About three-quarters of students noted opportunities in hard/resistant materials (75 percent) and food technology/biotechnology (74 percent), while smaller proportions indicated they had been involved in electronics (38 percent) or media/graphic design (37 percent).

More students in 2021 reported involvement in each of a list of technologies than was the case in 2016. Most notably, the proportions of students who indicated they had 'done' computer programming/coding/robotics rose from 28 percent in 2016 to 54 percent in 2021, and the proportions of students who indicated they had 'done' media/graphic design rose from 19 percent in 2016 to 37 percent in 2021. Students at mid decile schools reported notably less frequent involvement in three of the technologies listed than students at high decile or low decile schools. These technologies were computer programming/coding/robotics, electronics, and media/graphic design.

Overall, Year 8 students reported more frequent opportunities to learn technology at school than Year 4 students. The opportunity to learn technology most frequently reported by Year 4 students was talking about and making models of their design ideas. At Year 8, the most frequently reported learning opportunities included exploring and working with different materials (e.g. textiles, food, word, or metal). Talking about their own and others' work in technology was reported as happening frequently by students at both year levels. Consistent with the reports from students, Year 8 teachers reported that their students had more frequent opportunities to learn technology than Year 4 teachers. In general, teachers indicated that the students in their classes experienced each of the learning opportunities more often than the students themselves indicated they did.

A greater proportion of Year 8 teachers than Year 4 students reported that their students spent more than 40 hours a year learning technology at school. Students spending more than 40 hours a year was noted by 66 percent of Year 8 teachers and 21 percent of Year 4 teachers. No differences by decile were found in teachers' reports of time spent learning technology.

Almost all principals were positive about teaching and learning in technology at their school. Principals were less positive about the quality of reporting to parents and whānau than they were about other elements of teaching and learning in technology.

Digital technologies

Most teachers at both Year 4 and Year 8 indicated that they had received professional learning and development (PLD) support focused on the digital technologies curriculum content. School-led PLD was the most common form of support for teachers at both Year 4 (75 percent of teachers) and Year 8 (66 percent of teachers). Approximately one-third of teachers also reported receiving support from the Ministry of Education's Kia Takatū ā-Matahiko Digital Readiness Programme.

Teachers' responses indicated a reasonable level of confidence with the new digital technologies curriculum content. At least 70 percent of teachers at both Years 4 and 8 indicated that they 'agree' or 'strongly agree' with statements related to confidence, such as: "I am able to teach the digital technologies curriculum content" and "I understand the revisions to the digital technologies curriculum". It should also be noted that a non-negligible proportion of teachers indicated that they lacked confidence with digital technologies. Up to 26 percent of Year 4 teachers and 13 percent of Year 8 teachers reported that they 'disagree' or 'strongly disagree' with the confidence statements.

Most teachers reported that they had experienced some level of challenge in understanding the digital technologies curriculum content. The two factors identified by teachers as most challenging both involved using equipment to deliver aspects of digital technologies.

Almost all of the principals indicated that their school had, to some extent, updated their planning processes to incorporate digital technologies within the technology learning area (93 percent of principals in Year 4 schools and 92 percent of principals in Year 8 school). Overall, however, most principals reported that their schools had experienced some level of challenge in implementing the digital technologies curriculum content. The principals of schools participating at Year 8 were more positive about their school's provision for student learning in the new digital technologies curriculum content than principals of schools participating at Year 4. Seventy-eight percent of Year 8 principals rated their school's overall provision as 'good' or 'very good', while 56 percent of Year 4 principals gave the same rating.

Half of the principals indicated that teachers in their school were either 'enthusiastic' or 'very enthusiastic' about implementing the digital technologies curriculum content. Slightly higher levels of enthusiasm were noted at Year 8 than at Year 4.

1 Introduction to the National Monitoring Study of Student Achievement

This chapter provides a broad overview of the purpose and features of the National Monitoring Study of Student Achievement (NMSSA), introduces the 2021 study, outlines the structure of the technology learning area report and describes where further information and reporting is located.

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 and state-integrated schools. The main purposes of NMSSA are to:

- provide a snapshot of student achievement against the New Zealand Curriculum (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 and Pacific students. Where appropriate, it also reports on the achievement of students in the study with learning support needs.

The study focuses on each of the eight learning areas of the NZC over a five-year cycle. The first cycle set the baseline for measuring change in student achievement over time and was conducted from 2012 to 2016. This technology report concludes the second five-year cycle for the study and builds on information about achievement in technology collected in 2016.

NMSSA 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 student achievement. This information includes: student attitudes to, and their confidence and opportunities to learn in, the specific learning area being investigated; teachers' confidence in teaching the specific learning area and their views on the learning opportunities provided to students in classroom programmes; teacher and principal views of the professional and curriculum support received by teachers; and the provision in the school for the learning area.

The project is supported by advisory panels of curriculum experts and sector representatives.

2. The impact of COVID-19 lockdowns on the 2021 NMSSA study

In 2021, the NMSSA study focused on three learning areas from the NZC: technology, learning languages and the arts. This was a greater number than previous NMSSA studies, which typically involved two learning areas. The focus on three areas was made necessary after the 2020 NMSSA study was cancelled due to disruption caused by COVID-19.

Data was collected for the 2021 NMSSA assessment programme during Term 3 (July to September) of the school year. This was interrupted by a nationwide lockdown associated with COVID-19 that occurred midway through the term. This resulted in the entire programme being suspended for two and a half weeks. When the study resumed in Week 7 of the term, schools in Auckland and Northland were still in lockdown and unable to participate. To make the most of the time remaining for data collection, the NMSSA team adjusted the programme so that one and a half, rather than two and a half days, was required in each school. This enabled a shortened assessment programme to be undertaken in most of the remaining schools outside Auckland and Northland in the last weeks of the term.

The interruption to the programme has meant that the national sample for 2021 is made up of fewer students from a smaller number of schools than was originally intended. In total, about 1,100 students were involved in the study at each year level. The students represented 61 schools at Year 4 and 64 schools at Year 8. This compares with the original intention to sample about 2,200 students from 100 schools at Year 4 and 100 schools at Year 8.

The interruption to the study also affected the general representativeness of the sample across the regions (Table 1.1) and across school decile and ethnic groups (Table 1.2). As can be seen, students from Auckland are underrepresented. In addition, the number of Pacific students involved in the study is low (about 100 at each year level).

Table 1.1 Comparison of the percentage of students nationally and in the actual sample, by region

Region	Year 4		Year 8	
	Expected sample (%)	Actual sample (%)	Expected sample (%)	Actual sample (%)
Auckland	36	18	33	15
Bay of Plenty, Waiariki	8	7	8	11
Canterbury and Chatham Islands	12	20	12	17
Hawke's Bay, Tairāwhiti	5	6	5	3
Nelson, Marlborough, West Coast	3	4	4	1
Otago, Southland	6	8	7	9
Tai Tokerau	4	2	4	4
Taranaki, Whanganui, Manawatu	7	7	7	11
Waikato	9	11	9	12
Wellington	11	17	11	16

Table 1.2 Comparison of the percentage of students nationally and in the actual sample, by decile and ethnic group

Variable		Year 4		Year 8	
		Expected sample (%)	Actual sample (%)	Expected sample (%)	Actual sample (%)
Decile	Decile 1–2	17	12	15	11
	Decile 3–4	17	15	16	18
	Decile 5–6	16	16	22	20
	Decile 7–8	22	25	23	33
	Decile 9–10	28	33	23	19
Ethnicity	New Zealand European	57	62	61	67
	Māori	24	23	26	28
	Pacific	13	10	13	8
	Asian	18	15	13	10
	Other	5	5	4	4

The NMSSA team investigated the possibility of using sample weights to adjust for differences between the achieved sample and the expected nationally representative sample. This work showed that the impact of weighting was minimal. As a result, NMSSA has not used weighting in reporting. However, NMSSA has chosen to limit some aspects of the reporting, especially for smaller groups in the sample such as Pacific students. While the reporting does provide results for Pacific students, these are not used to draw inferences at a national level or to make comparisons with other groups.

The impact of the COVID-19 lockdown on the sample reduces the statistical confidence associated with the 2021 results. There is also a possibility that the lockdown interrupted students' learning and that some students on their return to school may have found it difficult to perform at their best in the study. This needs to be kept in mind when interpreting the results. It is also important to consider the more general impact of the COVID-19 pandemic. In the 18 months leading up to the study, schools, students and whānau had to cope with a considerable amount of disruption, including extended periods of remote learning. Over this time, schools had to prioritise how they used time and put more effort into maintaining student wellbeing and providing pastoral care. Although NMSSA cannot directly quantify any learning losses associated with disruptions caused by COVID-19, it is likely that they have had at least some negative impacts.

3. Structure of the technology report

This report is designed to provide a succinct overview of the key findings from the 2021 NMSSA study of the technology learning area. The report is set out in four chapters.

- This chapter provides a broad overview of the NMSSA programme.
- Chapter 2 briefly describes the 2021 technology programme, and provides information about the achievement measure used to assess technology (the TELI assessment), and the contextual questionnaires.
- Chapter 3 presents the findings for Year 4 and Year 8 student achievement in technology. It also compares achievement between Year 4 and Year 8 students, and differences between subgroups of gender, ethnicity, school decile and type of school. Differences in achievement from the NMSSA assessment of technology in 2016 are discussed.
- Chapter 4 presents reporting associated with contextual questionnaires for students, teachers and principals.

An appendix to the report contains summary statistics related to the assessment of technology.

4. Further information

This report is supplemented by several other reports and resources, all of which can be found on the NMSSA website (www.nmssa.otago.ac.nz). These include:

- A *Summary of Results from the 2021 NMSSA* for schools and teachers. This is sent to all schools via the Education Gazette in addition to being available on the website.
- An *Insights Report* which provides in-depth information for teachers and schools about the 2021 NMSSA technology learning area study, including annotated examples of questions and tasks used in the assessments.
- The *Data Window*, which is an online interactive application that allows users to generate tables and graphs using achievement and contextual data generated by the 2021 study.
- The report *Technical Information 2021*, which contains background and technical information[4] for the three learning areas studied in 2021 (technology, the arts, and learning languages).

[4] NMSSA Report 27: Technical Information 2021.

2 NMSSA Assessment Programme for the Technology Learning Area

This chapter provides an overview of the 2021 NMSSA study of the technology learning area. It includes three parts.

- Part 1 discusses the technology learning area of The New Zealand Curriculum (NZC).[5]
- Part 2 describes previous assessments of technology and how these relate to the 2021 assessment programme.
- Part 3 describes the components of the 2021 NMSSA assessment programme for technology. It includes descriptions of the skills and knowledge associated with increasing achievement on the TELI measurement scale, which was constructed to report results for achievement in technology.

1. Technology and The New Zealand Curriculum

Technology was introduced as a learning area in the NZC in 1995, and updated alongside all other learning areas in the 2007 revision of the curriculum. In 2017, the learning area of technology was revised to strengthen the positioning of digital technologies within the NZC. This change was substantial. It signalled the need for a greater focus on "students building their skills so they can be innovative creators of digital solutions, moving beyond solely being users and consumers of digital technologies".[6]

The technology learning area comprises three strands, which were unchanged in the 2017 revision. The strands provide an organising structure for the area and are integrated into teaching and learning programmes. The strands of technology are:

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

The three strands of the learning area are embedded within five technological areas, which provide contexts for learning. Two of these areas reflect digital technologies and were introduced in the 2017 revision of the learning area. The remaining three areas were common within schools' practice prior to 2017, but the revision explicitly added them to the structure of the learning area. The technological areas of the NZC are:

- Designing and developing materials outcomes: developing knowledge and skills to form, transform and work with resistant materials, textiles and fashion
- Designing and developing processed outcomes: developing knowledge of the materials and ingredients used to formulate food, chemical and biotechnological products
- Design and visual communication: developing an awareness of design by using visual communication to conceptualise and develop design ideas
- Computational thinking for digital technologies: developing algorithmic thinking skills and an understanding of the computer science principles that underpin all digital technologies
- Designing and developing digital outcomes: developing understandings and skills for designing and producing quality, fit-for-purpose, digital outcomes.

5 Ministry of Education. (2007). *The New Zealand Curriculum.* Wellington, New Zealand: Learning Media Ltd.
6 Te Kete Ipurangi (TKI) *https://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum/Technology*

Expectations of student achievement in technology are described in two ways. Achievement objectives structured around the eight levels of the NZC are associated with the three non-digital technological areas, while progress outcomes describe the significant learning steps that students take as they develop expertise in the two technological areas associated with digital technologies. Eight progress outcomes are provided for each of these areas with the first five unevenly spaced across levels 1 to 5 of the NZC.

2. Previous assessment of technology

The 2021 NMSSA study of technology builds on the first NMSSA study of technology, which was carried out in 2016. The 2016 study involved used a group-administered assessment focused on technological literacy (the TELI assessment).

In 2016, 73 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 associated with achieving curriculum level 4 objectives.

From 1996 to 2008, prior to NMSSA, the National Education Monitoring Project (NEMP) monitored achievement in aspects of technology in four-yearly intervals at Year 4 and Year 8. Apart from an increase in achievement between 1996 and 2000 at Year 8 on tasks requiring analysis and description of materials and processes, there was little or no change in overall achievement in the aspects of technology assessed during the monitoring period.

3. The 2021 NMSSA assessment programme in the technology learning area

The aim of the 2021 NMSSA technology study was to assess the achievement and progress of Year 4 and Year 8 students in the technology learning area of the NZC, and identify contextual factors associated with achievement. With the support of an advisory panel, the NMSSA team developed a programme for the 2021 study of the technology learning area with three components (see Table 2.1). The first component focused on assessing achievement in technology. The second and third components looked at student, teacher, and principal perspectives regarding teaching and learning in technology. The programme built upon the programme used in 2016, with particular attention given to the addition of the new digital technologies curriculum content. Table 2.1 summarises the focus and approach for each component of the 2021 technology programme.

Table 2.1 Components of the 2021 NMSSA programme in the technology learning area

Component	Strand and IP component	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 involving an artefact or video stimulus • interview tasks involving computer programming • completed by all Year 4 and Year 8 students (about 1,100 at each year level) • a substantial revision of the 2016 TELI assessment to accommodate changes to the curriculum
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 800 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 the principal or a senior-leader at each school (about 50 principals at each year level) • completed by up to three teachers at each school (125 teachers at Year 4 and 166 teachers at Year 8)

* Applied only to Year 8 students

Component 1: The Technological Literacy (TELI) assessment

NMSSA assessed achievement in technology with a group-administered assessment called the Technological Literacy (TELI) assessment. 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.

In 2021, NMSSA used a revised version of the TELI assessment that was administered in the 2016 study. The revisions included material focused on the new digital technology areas. This material was both integrated into existing tasks, and incorporated within new tasks.

The TELI assessment was presented to about 1,100 students at each year level. Just over half of the tasks focused on an artefact or object (e.g. a hole punch, or fabric with particular qualities) and just under half of the tasks focused on a scenario presented via video clip.

The assessment 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 a response to questions on paper. These tasks were completed by a subset of students at each year level.

The TELI assessment drew from a bank of 15 tasks at Year 4 and 17 tasks at Year 8. Following the COVID-19 lockdown, several tasks at each year level were discontinued, leaving 12 tasks at each of Years 4 and 8.

Each task included a set of questions based on one or more elements of the technology learning area. 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, 0 to 3, or 0 to 4. Some aspects of the technological practice strand which involve students using extended processes to make artefacts in authentic contexts could not be accommodated in the assessment.

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. New and revised tasks were piloted in Dunedin schools before being used in a larger trial involving schools in Dunedin and Auckland.

The tasks were divided into four linked booklets with each student answering questions related to six or seven tasks. Some tasks were administered to students in groups, and other were administered in the context of an interview. 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 per school, worked in groups of nine to complete one of the four linked booklets. The students accessed the stimulus and direct entry items through NMSSA laptop computers. These sessions were facilitated by the 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.

TELI scale

An Item Response Theory (IRT) approach[7] was used to analyse the student responses to the 2021 TELI assessment. The IRT approach allowed 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.

[7] 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 techniques used to do the scaling were similar to those used in studies such as PISA and TIMSS.

Similar to all NMSSA scales, the TELI scale is designed so that the combined average score for Year 4 and Year 8 students in 2021 was 100 scale score units and the average standard deviation over the two year levels was 20 scale score units.

Achievement against the curriculum and change over time

The revision of the TELI assessment to accommodate the changes to the curriculum means that results from the scale constructed for 2021 cannot be compared directly with the scale constructed in 2016. It also means that the results of a curriculum alignment exercise used to benchmark achievement against the curriculum on the 2016 scale are not appropriate for use with the 2021 scale. A decision was made not to undertake a new curriculum alignment exercise to create benchmark scores for the new scale. This was due to the relative newness of the digital technologies content, which means that curriculum expectations are still being 'bedded in'. It also recognises that the structure of the NZC is currently under review, which means that a new round of benchmarking will most probably be needed in the near future.

To provide a sense of change over time, this report looks at how raw scores have changed on items that were used in the assessments at both time points.

Item map

Figure 2.1 provides an item map that shows how each of the tasks in the TELI assessment was located on the TELI scale. Each task is represented by a coloured rectangle, with the squares and dots within each rectangle representing the items that made up the task. The items represented as squares involved a focus on digital technologies. Items that are located higher on the scale were relatively more difficult than the questions located lower on the scale. As an example, the task *School Sunhat* was administered to Year 4 and Year 8 students and involved 5 separate items. Four of these were focused on digital technologies. The easiest question in the Sunhat task had a non-digital focus.

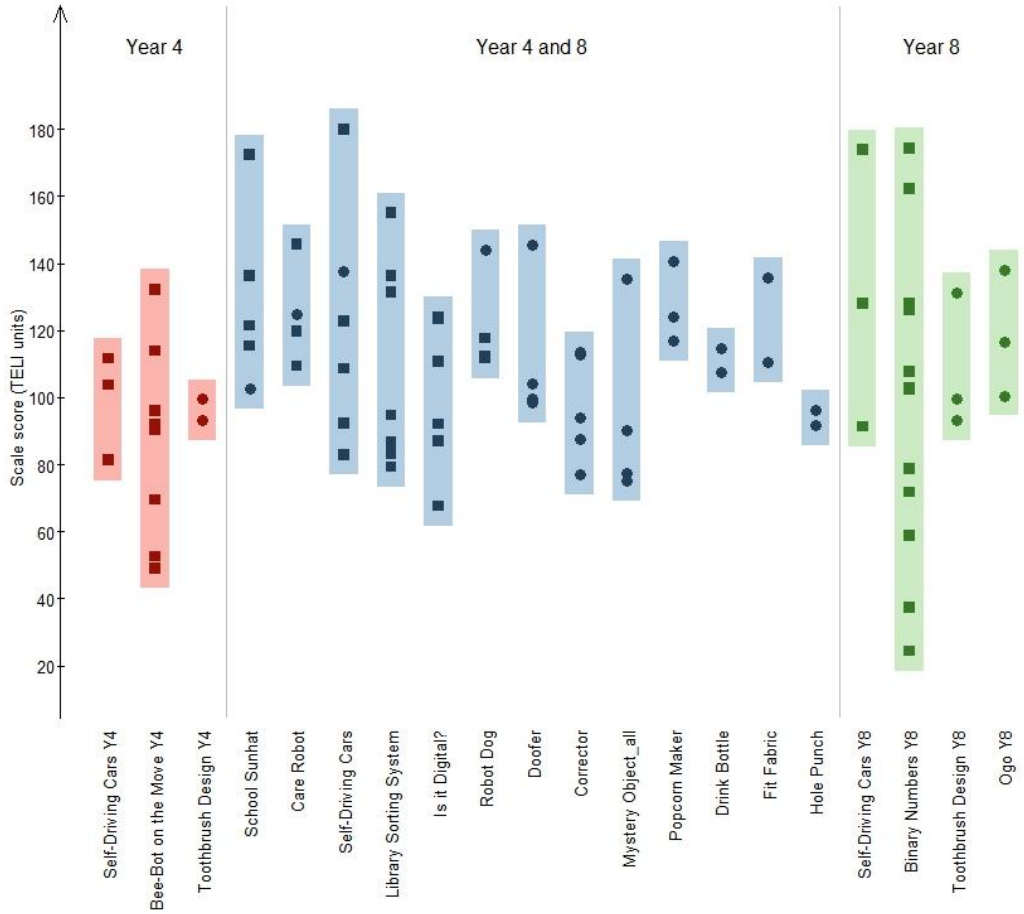

Figure 2.1 The item map for the TELI assessment

Alignment of tasks with the technology learning area

Table 2.2 shows how the 2021 assessment tasks align with the elements of the technology learning area. Note that some tasks align with more than one curriculum element, as different items within the task focused on different aspects of technology. A substantial number of tasks included a focus on the Nature of Technology by including items that required students to think critically about the impact of technology on societies and the environment, and the socially embedded nature of technology.

Table 2.2 Coverage of assessment tasks across elements of the technology learning area

Learning area element		Number of tasks		
		Years 4 and 8	Year 4 only	Year 8 only
Technological Practice	Planning for practice		1	1
	Brief development	1	1	1
	Outcome development and evaluation	2		
Technological Knowledge	Technological modelling	2		1
	Technological products	1		
	Technological systems	5		
Nature of Technology	Characteristics of technology	2	1	2
	Characteristics of technological outcomes	8		1
Progress Outcomes	Computational thinking for digital technologies	1	2	3
	Designing and developing digital outcomes	5		

TELI scale description

Figure 2.2 provides a description of technology skills and knowledge measured by the TELI scale.

To create the scale description, the scoring categories for each question (0, 1 or 2 for instance) in the TELI assessment were located on the scale. This meant identifying where the students who were awarded each possible score on the item were most likely to have achieved overall on the scale. For example, the scoring category '1' for item 4 of technology task *School Sunhat* (shown in Figure 2.1) was located at the part of the scale where students who scored a '1' on that question achieved, on average, for the whole assessment. Once this had been done for all questions, 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 four-part description, providing a broad indication of what students typically know and can do across the learning area of technology when achieving at different places on the scale.

The description provides 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, achievement objectives, or progress outcomes. They are a direct reflection of what was assessed and how relatively hard or easy students found the content of the assessment.

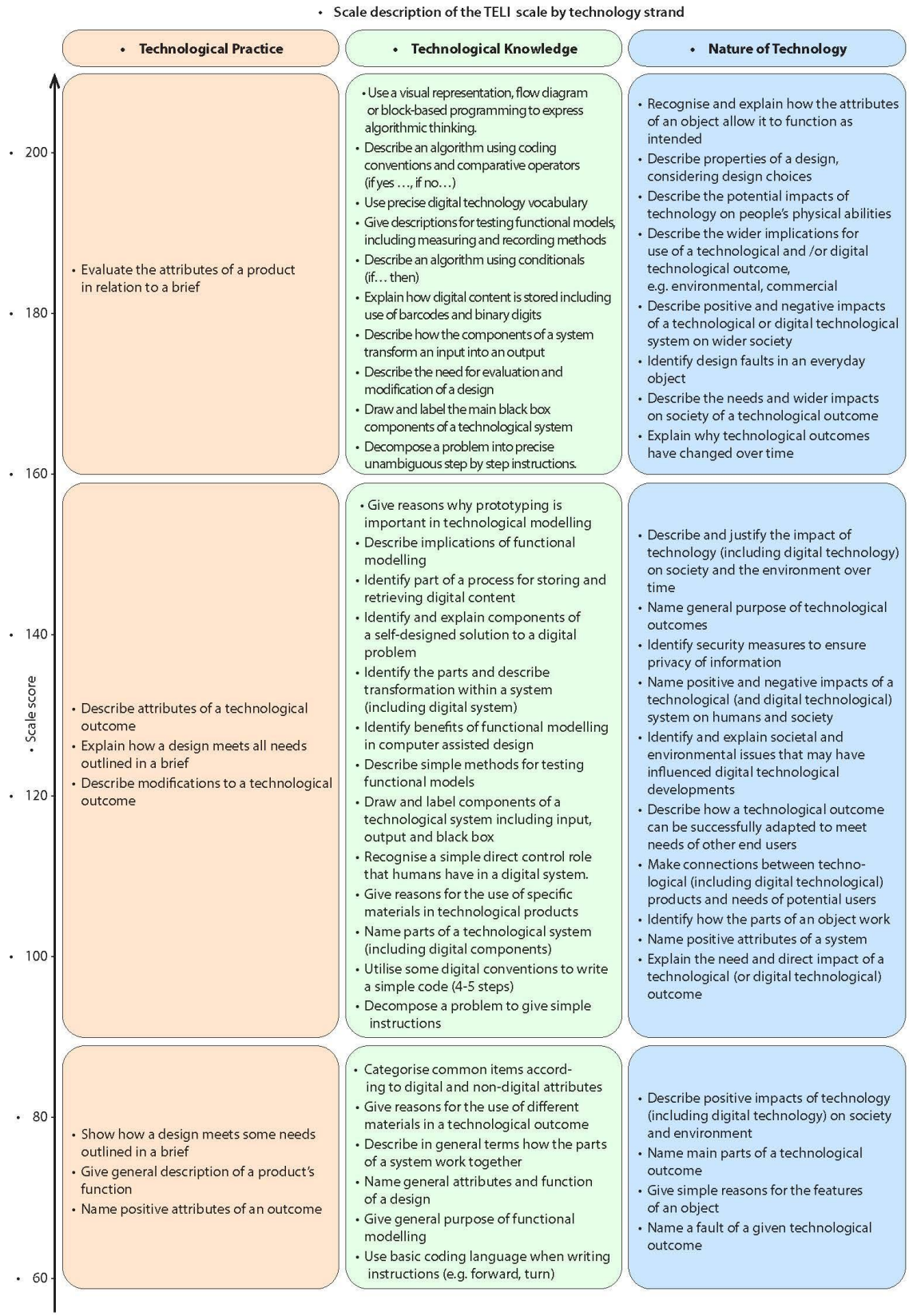

Figure 2.2 Description of the TELI scale

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, technological areas, and task stimulus material). Each task consists of several items. Examples of the questions students responded to, the scoring guide and possible student responses are illustrated.

Task: *School Sunhat*

The *School Sunhat* task was first used in the 2016 NMSSA study of technology achievement, and it was extended in 2021 to include elements of digital technology. In the task, 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 five items. The first item required students to sketch and explain how the sunhat met the design brief (Figure 2.3). The second item required students to explain how using a computer might help a person when they design a sunhat (Figure 2.4). The third, fourth, and fifth items were new in 2021 and required students to design a digital solution to the problem of tamariki forgetting to wear their sunhats when they ate outside (Figures 2.5–2.7).

Curriculum elements:	**Technological Practice, Technological Knowledge, Designing and Developing Digital Outcomes**
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:	**Describes 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 <u>one</u> need outlined in brief / Inappropriate response	No labels on drawings
1: Explains how design meets <u>two</u> 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 <u>all three</u> needs outlined in brief	All of the above

Figure 2.3 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 functional 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 2.4 Item 2 of the TELI task *School Sunhat*

Item 3.	Think of a way digital technologies, for example, computers, apps, programs, could be used to remind the tamariki to wear their sunhats. a) Draw a labelled diagram to show your idea b) Explain how your idea works
Component:	**Designs a solution which includes the use of digital tools or devices**
Scoring category	**Example responses**
0: Potential solution with no/limited explanation	"The teacher will tell us."
1: Non-digital solution with explanation	"Sunburn warning poster with levels of burn time."
2: Digital solution with no/limited explanation of how components are connected	"Hat has a microchip."
3: Digital solution with simple explanation of how it works	"Each student has a barcode in their sunhat which is scanned and beeps, which allows them to exit classroom"
4: Digital solution with full explanation of how all components in the system connect	"An app on the student's phone is connected to the school timetable which sends a sunhat image to phone screen and vibrates when it is breaktime."

Figure 2.5 Item 3 of the TELI task *School Sunhat*

Item 4.	
Component:	**Designed solution includes linked digital components**
Scoring category	**Example responses**
0: Limited response	No labels on diagrams
1: Technological response	Digital devices or components are included and clearly labelled e.g. speaker, video, email, text, alarm, tablet, sensor.

Figure 2.6 Item 4 of the TELI task *School Sunhat*

Item 5.	
Component:	**Designed solution is described using digital technology process terms**
Scoring category	**Example responses**
0: Limited response	Uses everyday language e.g. reminder, sound, noise
1: Technological response	Solution is described using appropriate digital technology process terms e.g. data, pairing, interface, download, casting.

Figure 2.7 Item 5 of the TELI task *School Sunhat*

Task: *Self-Driving Cars (Year 4)*

The *Self Driving Cars* task for Year 4 students was one of several new tasks introduced in 2021 with a focus on digital technologies. Students were shown a short video clip about self-driving cars. The first part of the task focused on the Nature of Technology strand. It asked students to describe what is good and not so good about self-driving cars and describe possible societal impacts. The second part of the task focused on Computational Thinking for Digital Technologies and is shown below (Figure 2.8). It involved creating a set of step-by-step instructions to program a car's computer. Item 1 required students to write an accurate set of instructions (Figure 2.9). Item 2 required students to use appropriate coding conventions (Figure 2.10), and item 3 required students to identify that multiple sets of instructions can be used to solve the same problem (Figure 2.11).

Curriculum Strands: **Computational Thinking for Digital Technologies**

Sam needs to get from home to the supermarket in their self-driving car.

The car cannot drive through the shaded squares. It can't go backwards or diagonally.

Create a set of step-by-step instructions to program the car's computer, so that the car drives Sam from home to the supermarket.

The car needs to land in the supermarket square.

You can use the toy car to help you.

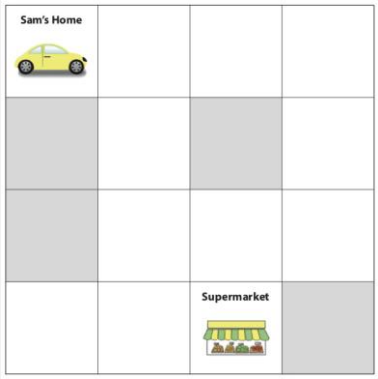

Figure 2.8 Part two of the TELI task *Self-driving Cars (Year 4)*

Item 1.	**Create a set of step-by-step instructions to program the car's computer, so that the car drives Sam from home to the supermarket.**
Component:	**Provides accurate and unambiguous code**
Scoring category	**Example responses**
0: Limited response	"Go from home and turn down towards the supermarket."
1: Code has a bug related to an incorrect number of steps	The counting includes the square where car is placed initially.
2: Code has a bug because turns are omitted	"Forward3, Down2, Forward1, Down1"
3: Code has a bug due to left/right confusion	"F3, turn right, F2, turn left, F1, turn left"
4: **Code is accurate with no bugs**	

Figure 2.9 Item 1 of the TELI task *Self-driving Cars (Year 4)*

Item 2.	**Create a set of step-by-step instructions to program the car's computer, so that the car drives Sam from home to the supermarket.**
Component:	**Uses appropriate coding conventions**
Scoring category	**Example responses**
0: No use of coding conventions	Directional arrows drawn into the grid provided. Instructions written as a narrative.
1: Simple coding vocab is used: directional arrows, words or letters	"Forward, down, down, down, turn right, forward"
2: Repeat code is used to express algorithmic thinking	"Forward 1 square, turn right, forward 3 squares, turn left, forward 1 square "
3: Truncated repeat code is used consistently to express algorithmic thinking	"F3, R, F2, L, F1, L"

Figure 2.10 Item 2 of the TELI task *Self-driving Cars (Year 4)*

Item 3. How many ways can Sam get from home to the supermarket? (Circle your answer)
Component: Identifies that there can be more than one algorithm for the same problem
Scoring category
0: One
1: Two or three
2: Four

Figure 2.11 Item 3 of the TELI task *Self-driving Cars (Year 4)*

Component 2: Student perspectives on technology

The third component of the study explored students' perspectives on learning in technology. Students were asked to complete a questionnaire presented on a laptop. The questionnaires asked students about their attitude, confidence and opportunities to learn in technology.

Component 3: Teacher and principal perspectives on technology

The final component of the NMSSA technology programme used questionnaires to explore teachers' and principals' perspectives on teaching and learning in the technology learning area.

Up to four teachers from each school were asked to fill in a questionnaire. The teachers invited to participate were those who had the most students participating in NMSSA assessment, and/or were specialist technology teachers. The questionnaire asked teachers about their attitude towards, and confidence in, teaching technology, and the professional support they had received for teaching the revised technology learning area. Teachers were also asked to identify the nature and extent of the learning opportunities provided for students in technology. The principals of the schools involved in the study were asked to complete a separate principal questionnaire. The principal questionnaire included items about school structures and provisions that support technology learning in general, and schools' experiences of implementing the revised technology learning area.

3 Student Achievement in Technology

This chapter describes Year 4 and Year 8 student achievement in the 2021 NMSSA assessment of technology. It also provides an indication of change over time by comparing achievement on common items used in 2021 and 2016. Unless stated otherwise, any score differences reported between groups on the TELI scale are statistically significant.

As described in Chapter 1, the sample of students involved in the 2021 study was affected by disruptions associated with COVID-19. This means that the results reported in this chapter are based on fewer students from a smaller number of schools than previous NMSSA studies. This affects the reliability of the results, particularly for smaller groups in the sample, including results for Pacific students. In this chapter, results for Pacific students are shown. However, they are not used to make inferences at a national level or to make comparisons with non-Pacific students.

Given the recent changes to the technology curriculum and because a refresh of the New Zealand curriculum is currently underway, it was decided not to define score ranges on the new TELI scale associated with curriculum levels. This means that results are not reported against curriculum levels.

Tables of results related to the achievement on the TELI assessment are available in the Appendix. Additional tables and graphics can be found using the *Data Window* on the NMSSA website (https://nmssa.otago.ac.nz/).

Overall achievement in technology

The average score for Year 8 students in technology was 32 TELI scale score units higher than for Year 4 students

The difference between the average scores for Year 4 and Year 8 students on the 2021 TELI assessment was 32 TELI scale score units. This indicates that, on average, students make about 8 scale score units of 'progress' per year, between the two year levels and represents an annualised effect size of 0.4.[8] As a point of reference, an annualised effect size of 0.4 has been described as "typical", with effects larger than this associated with innovation that enhances achievement[9].

The annual rate of progress can be used to interpret the size of score differences in terms of 'years of progress'. This is indicative only and does not imply that the rate of progress between Year 4 and Year 8 is exactly the same each year.

Figures 3.1 and 3.2 show the distribution of achievement for students in Year 4 and Year 8, respectively.

[8] The formula for the effect size calculation is: $\frac{M_1 - M_2}{\sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}}$, where M_1 and M_2 represent the average scores for group 1 and group 2, s_1 and s_2 their standard deviations and n_1 and n_2 the number in each group.

[9] Hattie, J. (2009). *Visible learning: a synthesis of over 800 meta-analyses relating to achievement.* Routledge (p. 17)

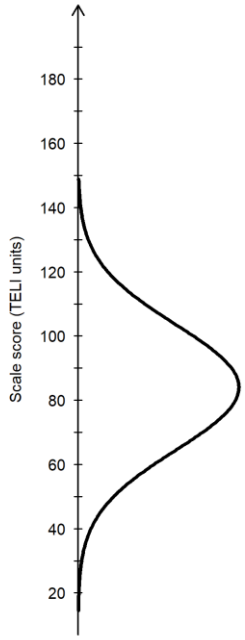

Figure 3.1 Distribution of scores for Year 4 students on the TELI assessment

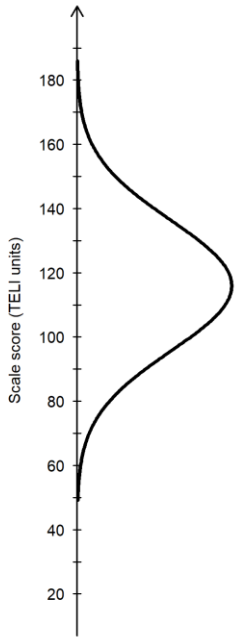

Figure 3.2 Distribution of scores for Year 8 students on the TELI assessment

Achievement by student-level variables in technology

Figures 3.3 and 3.4 display the score distributions on the TELI scale at Year 4 and Year 8 for all students and by gender and ethnicity.[10]

On average, girls scored higher on the TELI assessment than boys

Girls scored higher, on average, than boys on the TELI assessment at both year levels. The difference between the average scores for boys and girls was 5 scale score units at Year 4 and 7 units at Year 8. This difference is roughly equivalent to half a year of 'progress'.

There were differences in average achievement between ethnic groups on the TELI assessment

Achievement varied within and across ethnic groups. Each ethnic group was made up of high and low achievers and, on average, the learners in each group made similar levels of 'progress' between Year 4 and Year 8. On average, students who identified as ākonga Māori scored lower than those who did not—by 12 scale score units at Year 4 and 14 units at Year 8. It is important to note that greater proportions of ākonga Māori, compared with non-Māori learners, attended lower decile schools and that achievement also varied with decile.

[10] 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 was obtained from National Student Number information held on the Ministry of Education ENROL database. The 'New Zealand European' category (NZE) included New Zealand Pākehā, Australians and British/Irish. The 'Pacific' 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.

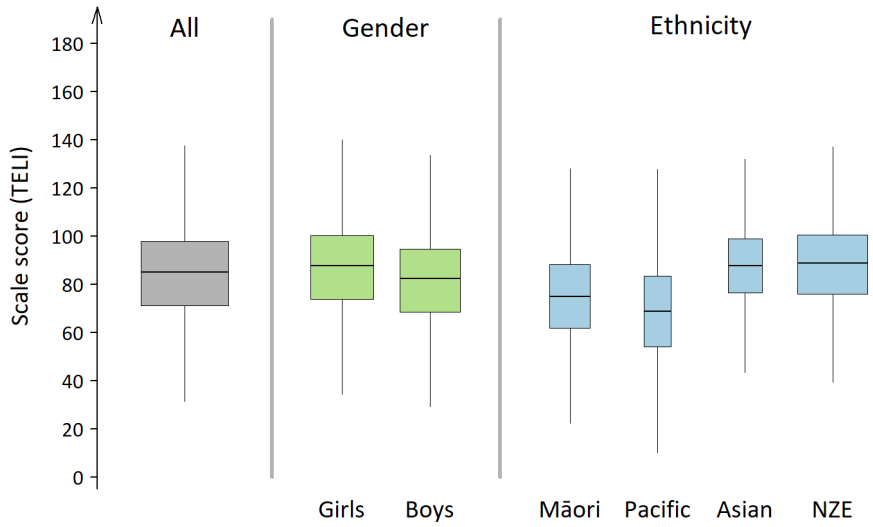

Figure 3.3 Distribution of scores for Year 4 students on the technological literacy (TELI) scale, by gender and ethnicity (NZE = New Zealand European)

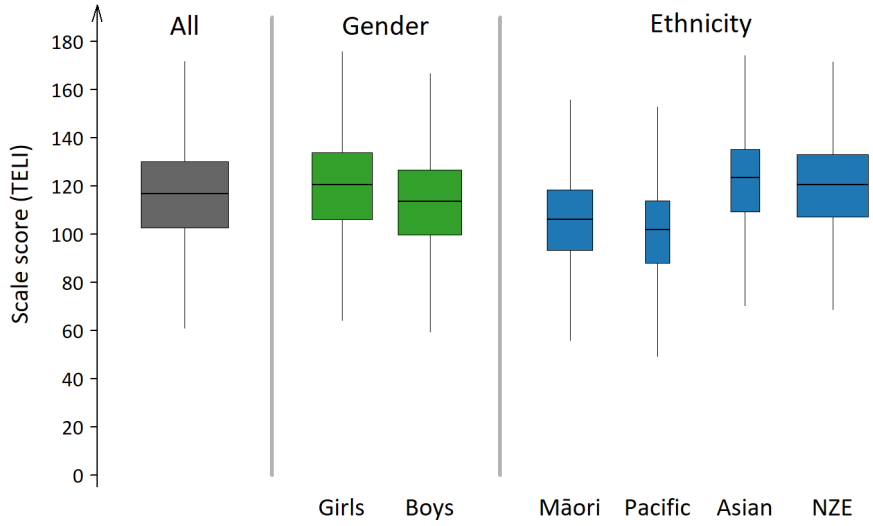

Figure 3.4 Distribution of scores for Year 8 students on the Technological Literacy (TELI) scale, by gender and ethnicity (NZE = New Zealand European)

Achievement by school-level variables on the TELI assessment

Figures 3.5 and 3.6 show the performance of students according to school decile band[11] and school type[12] for Year 4 and Year 8, respectively.

Differences in achievement were associated with school decile

At both Year 4 and Year 8, students attending high decile schools scored higher, on average, than students who attended mid decile schools. Students in mid decile schools, in turn, achieved more highly than those attending low decile schools. The difference between students attending high and low deciles schools at Year 4 was 21 scale score units. At Year 8, it was 20 units.

[11] 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.

[12] A *composite* school combines students from different year levels that are typically found in separate primary or secondary schools. A *restricted composite*, sometimes known as a middle school, caters for Years 7 to 10. A *contributing* school caters for Years 1 to 6 of schooling. A *full primary* school caters for Years 1 to 8 of schooling. *Secondary* schools cater for Years 7 to 15 of schooling, although many cater for Years 9 to 15 only. An *intermediate* school caters for Years 7 and 8 of schooling. The number of students in the study from restricted composite and composite schools was relatively low (44 and 82 students, respectively).

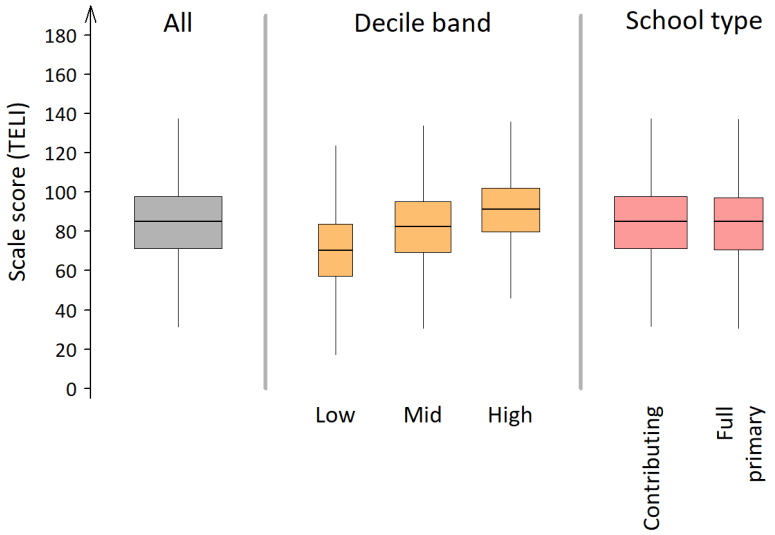

Figure 3.5 Distribution of scores for Year 4 students on the Technological Literacy (TELI) scale, by decile band and school type

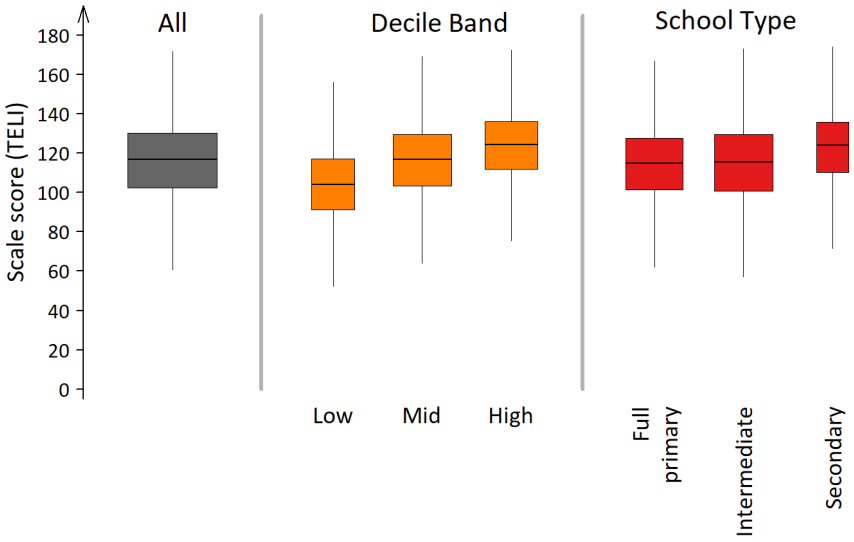

Figure 3.6 Distribution of scores for Year 8 students on the Technological Literacy (TELI) scale, by decile band and school type

Changes in achievement on the TELI assessment since 2016

Achievement in technology was last assessed in 2016. As described in Chapter 2, the TELI assessment which was originally developed for the 2016 study was revised in 2021 to include new material related to the two new digital technological areas introduced into the curriculum in 2017. The revision of the assessment has meant that scores on the TELI reporting scale for 2021 cannot be directly compared with scores on the scale used in 2016.

An indication of how achievement has changed overtime has been provided by considering how scores have changed on the assessment items that were used in both 2016 and 2021. Figures 3.7 and 3.8 use dumbbell plots to show how the average percentage score on each common question has either increased or decreased for Year 4 and Year 8, respectively. In the plots, the green dots are used to show the average percentage scores on the items in 2021 and the blue dots to show the average percentage scores in 2016. As an example, the task *Hole Punch* shown at the top of the first plot incorporated two common items. The average percentage score on one of these decreased between 2016 and 2021 and the other increased. The size of the decrease was slightly smaller than the size of the increase.

Overall, achievement on common items from the TELI assessment was lower in 2021 than in 2016

As can be seen, at both year levels, students scored lower on most of the common items in 2021 than students in 2016. The size of the changes varies from item to item, with the median change being about a 4 percentage point decrease at Year 4 and a 6 percentage point decrease at Year 8. In total, 21 out of 28 items showed decreases at Year 4, and 24 out of 31 items showed decreases at Year 8.

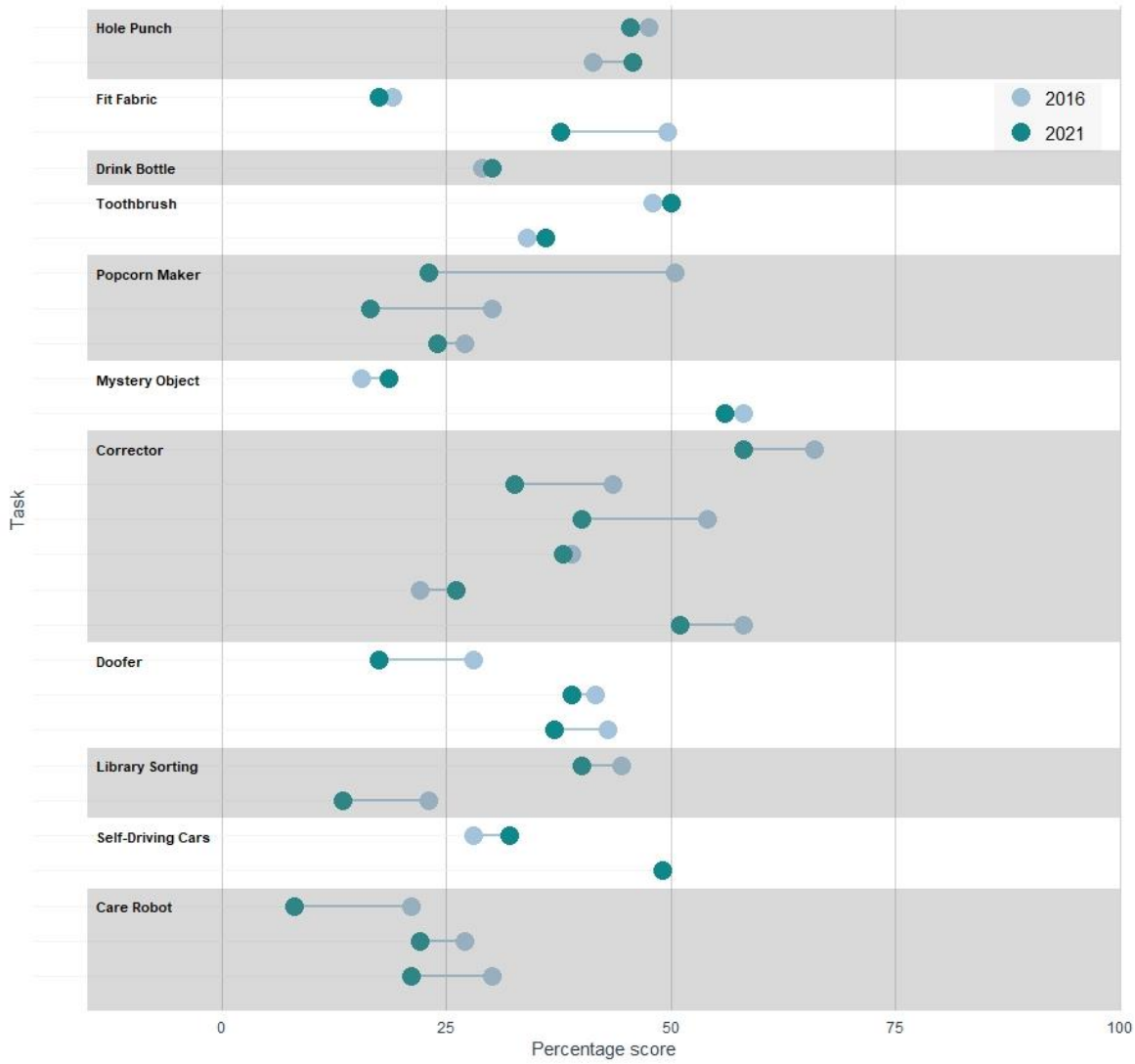

Figure 3.7 Average percentage scores on common items from the Technological Literacy (TELI) assessment used in 2016 and 2021 for Year 4

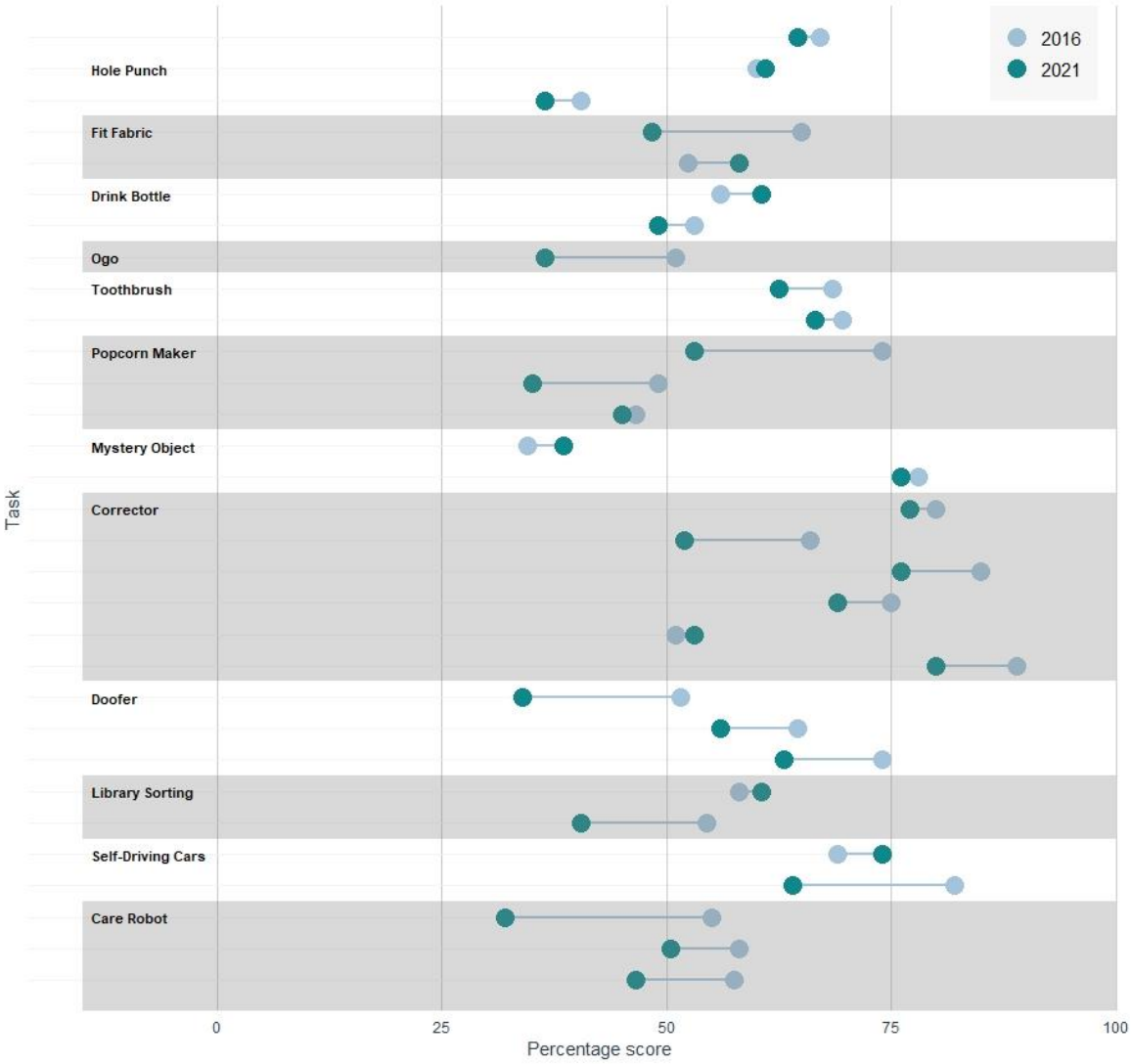

Figure 3.8 Average percentage scores on common items from the Technological Literacy (TELI) assessment used in 2016 and 2021 for Year 8

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 results from the students, teachers and principals. After a brief description of the sample of participating students, teachers and principals, the chapter focuses on four themes in turn: the use of specialist teachers in technology, attitudes to and confidence in technology, teaching and learning in technology, and the revision of the technology learning area to include digital technologies.

As described in Chapter 1, fewer schools took part in the 2021 NMSSA study due to interruptions associated with COVID-19 lockdowns. This means that care needs to be taken when using the findings to make inferences at a national level, especially for smaller subgroups within the sample. Given this, results for Pacific students have been provided in this chapter, but these are not used to draw inferences at a national level or to make comparisons with other groups.

Analysis included identifying differences in results related to subgroups of students (by school decile, ethnicity, and gender), and teachers and principals (by school decile). Differences greater than 15 percent are reported as 'notable' differences, where sub-groups are adequately represented. Where results include students' attitude and confidence scales, differences between sub-groups are reported as 'notable' when the 95% confidence interval for means of the two groups is not overlapping. Rounding means that percentages provided in tables may not always sum to 100.

1. Participating students, teachers, and principals

This section describes the sample of students, teachers, and principals, and provides an overview of the content of each questionnaire.

Participating students

In total, 803 students at Year 4 and 795 students at Year 8 completed a computer-based questionnaire – up to 18 students in each school. Table 4.1 shows the percentage of students who responded to the questionnaire, by decile band and year level.

Table 4.1 Percentage of students who responded to the questionnaire, by school decile band and year level

	Percentage of students			
	Year 4		Year 8	
Decile band	**Sample *N* = 803**	**National**	***Sample* *N* = 795**	**National**
Low (Deciles 1–3)	14	29	25	25
Mid (Deciles 4–7)	45	42	46	33
High (Deciles 8–10)	42	30	29	42

Most of the students who responded indicated that they 'always' speak English at home (69 percent at Year 4 and 80 percent at Year 8). A further 17 percent at Year 4 and 15 percent at Year 8 reported they 'often' spoke English at home.

The student questionnaire included items about attitudes towards and confidence in technology as well as students' opportunities to learn technology at school.

Participating teachers

Up to four teachers in each school completed a teacher questionnaire, with both classroom teachers and specialist technology teachers invited to participate. In total, 125 Year 4 teachers and 166 Year 8 teachers responded. Table 4.2 shows the percentage of teachers responding to the questionnaire at each year level, by school decile band.

Table 4.2 Percentage of teachers who responded to questionnaire, by year level and school decile

	Percentage of teachers	
School decile	**Year 4** ***N = 125***	**Year 8** ***N = 166***
Low (Deciles 1–3)	21	20
Mid (Deciles 4–7)	41	41
High (Deciles 8–10)	38	39

In general, the teachers who responded were reasonably experienced (see Figure 4.1). Most of the teachers had more than five years' teaching experience (73 percent at Year 4 and 77 percent at Year 8), and about 30 percent of teachers at both year levels had been teaching for more than 11 years (44 percent at Year 4 and 57 percent at Year 8).

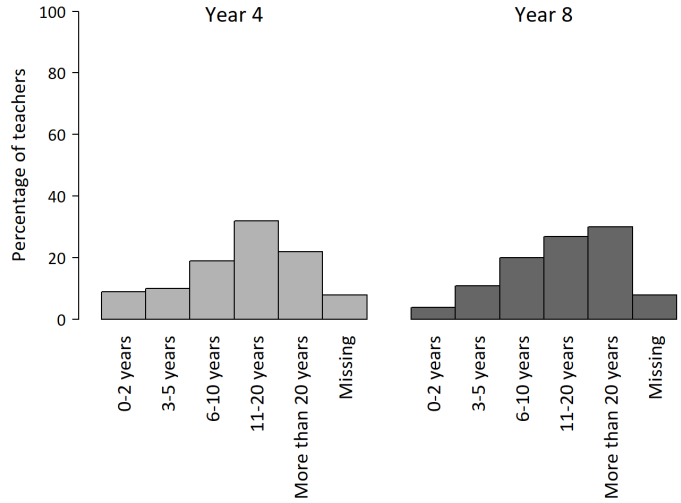

Figure 4.1 Teaching experience of participating teachers, full-time and/or part-time, by year level

The teacher questionnaire asked teachers about their attitude towards, and confidence in, teaching technology, and the professional support they had received for teaching the revised technology learning area. Teachers were also asked to identify the nature and extent of the learning opportunities provided for students in technology.

Participating principals

In total, 104 principals completed the principal questionnaire: 54 from schools participating at Year 4 and 50 from schools participating at Year 8. 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* = 54**	**Year 8** ***N* = 50**
Low (Deciles 1–3)	20	26
Mid (Deciles 4–7)	37	42
High (Deciles 8–10)	43	32

Principals were asked to identify what proportion of their students had English as their second or alternative language (Table 4.4). Overall, the majority of principals reported 25 percent or less of students with English as a

second or alternative language. Of the six principals who reported having over 50 percent of students with English as a second or alternative language in their school, two were from low decile schools, three were from mid decile schools, and one was from a high decile school.

Table 4.4 Percentage of principals reporting the proportion of students in their school who had English as a second or alternative language, by year level

	Percentage of principals	
Percentage of students	**Year 4** ***N = 54***	**Year 8** ***N* = 50**
25% or less	85	88
26%–50%	6	6
51%–75%	4	4
76%–90%	4	0
More than 90%	0	0
Missing	1	2

The principal questionnaire included items about school structures and provisions that support technology learning in general, and schools' experiences of implementing the revised technology learning area.

It is also 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. Use of specialist teachers in technology

This section reports on the use of specialist teachers in technology, using responses from teachers and principals.

Classroom teachers' level of responsibility

Teachers who had identified themselves as regular classroom teachers were asked about the level of responsibility they had for teaching their students technology. Figure 4.2 shows these results.

The use of specialist teachers of technology was much more common at Year 8 than at Year 4

The majority of Year 4 classroom teachers indicated that they have sole responsibility for teaching their students technology (81 percent). In comparison, 10 percent of Year 8 classroom teachers indicated that they had sole responsibility, with the majority indicating either shared responsibility (e.g. with a specialist teacher or an external provider) or no responsibility.

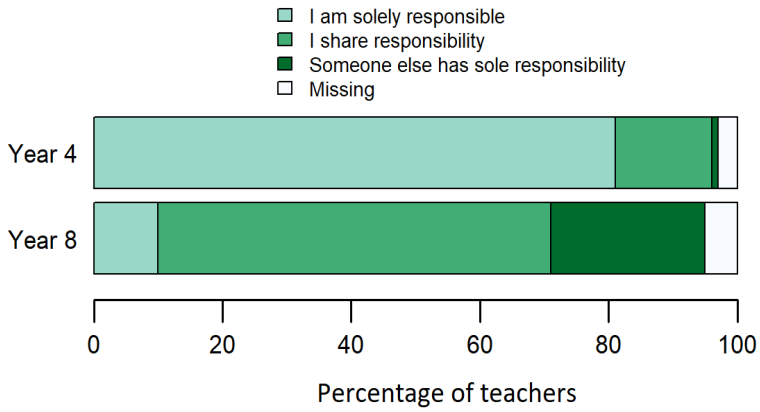

Figure 4.2 Classroom teachers' responsibility for teaching technology, by year level

Consistent with this finding, a higher proportion of Year 8 teachers than Year 4 teachers indicated that they were employed as specialist teachers of technology (24 percent of Year 8 teachers and 3 percent of Year 4 teachers). Additionally, a higher proportion of principals from Year 8 schools indicated that their school provides technology teaching by technology specialists for students from other schools (38 percent of principals from Year 8 schools compared with 9 percent of principals from Year 4 schools).

Delivery by technology specialists

Principals were asked to identify how the teaching and learning programmes in technology were delivered in their school. Figure 4.3 shows how principals from schools participating at Year 8 responded.

Principals indicate that some areas of technology were taught more frequently by specialists than others

Results suggest that the two technological areas most often taught by specialist teachers at Year 8 are designing and developing materials outcomes (delivered by a specialist in 94 percent of schools) and designing and developing processed outcomes (delivered by a specialist in 88 percent of schools). These two areas include the more established technological areas of hard materials, soft materials, textiles and foods. In comparison, the more recently introduced technological areas were less frequently taught by specialist teachers, with computational thinking for digital technologies and designing and developing digital outcomes delivered by a specialist in 64 percent and 66 percent of schools respectively.

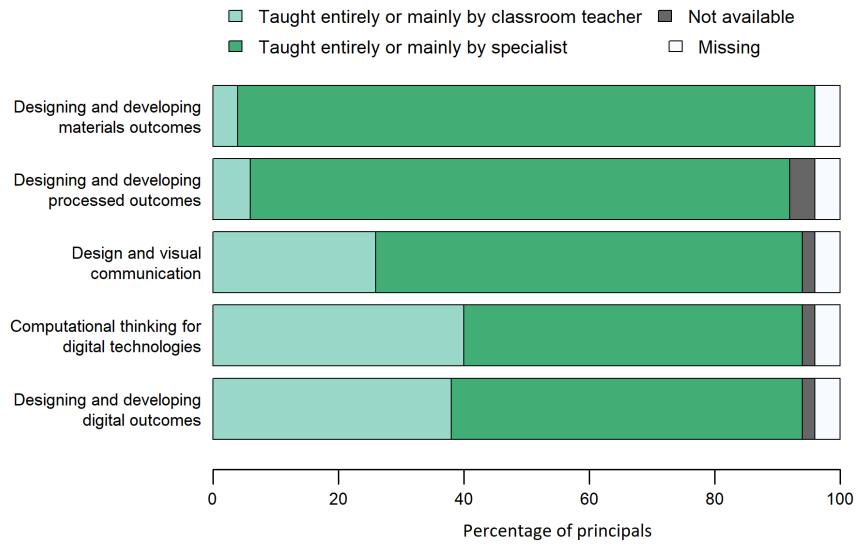

Figure 4.3 Principals from Year 8 schools' reports on how the technology teaching and learning programmes are delivered in their school

Results from principals in schools participating at Year 4 were similar. These principals were asked how the technology programme in their school was delivered overall, rather than by technological area. The majority indicated that technology was delivered entirely or mainly by the classroom teachers in their schools (78 percent), with a small proportion indicating technology was delivered entirely or mainly by specialist teachers (20 percent).

None of the principals at either year level reported using external providers to deliver technology programmes. This is similar to results from 2016 when small numbers of principals reported the use of external providers (up to 4 percent).

Results from teachers indicate that specialists more frequently taught the established technological areas than the new digital technology areas

Year 8 teachers were asked to identify all of the areas of technology that they taught (see Table 4.5) Specialist teachers of technology more frequently reported teaching the more established technological areas of designing and developing materials outcomes and designing and developing processed outcomes than classroom teachers. In contrast, classroom teachers more frequently reported teaching the two new digital

areas than specialist teachers. For example, designing and developing materials outcomes, which includes hard and soft materials, was taught by 52 percent of specialist teachers and 24 percent of classroom teachers. Computational thinking for digital technologies was taught by 61 percent of classroom teachers and 31 percent of specialist teachers.

Table 4.5 Percentage of Year 8 teachers teaching each technological area of the NZC

	Percentage of Year 8 teachers	
Technological area	**Classroom teachers** ***N*** **= 145**	**Specialist teachers** ***N*** **= 43**
Designing and developing materials outcomes (soft materials e.g. textiles and hard materials e.g. wood, metal, plastics)	24	52
Designing and developing processed outcomes (food and biotechnology)	13	34
Design and visual communication (media/ graphic design e.g. website design, logo design, digital art)	56	3
Computational thinking for digital technologies (computer science)	61	31
Designing and developing digital outcomes (computer programming, robotics, electronics)	51	28

3. Attitudes and confidence towards technology

This section reports on students' and teachers' attitudes and confidence towards technology.

Students' attitudes towards technology

Students were asked how much they agreed with each of a series of statements about their attitudes towards technology. Figure 4.4 shows the statements and how students at Years 4 and 8 responded.

Students' attitudes towards learning technology were generally positive

Students at both year levels were generally positive about technology, with the majority of students selecting that they 'agree quite a lot' or 'totally agree' for each of the statements.

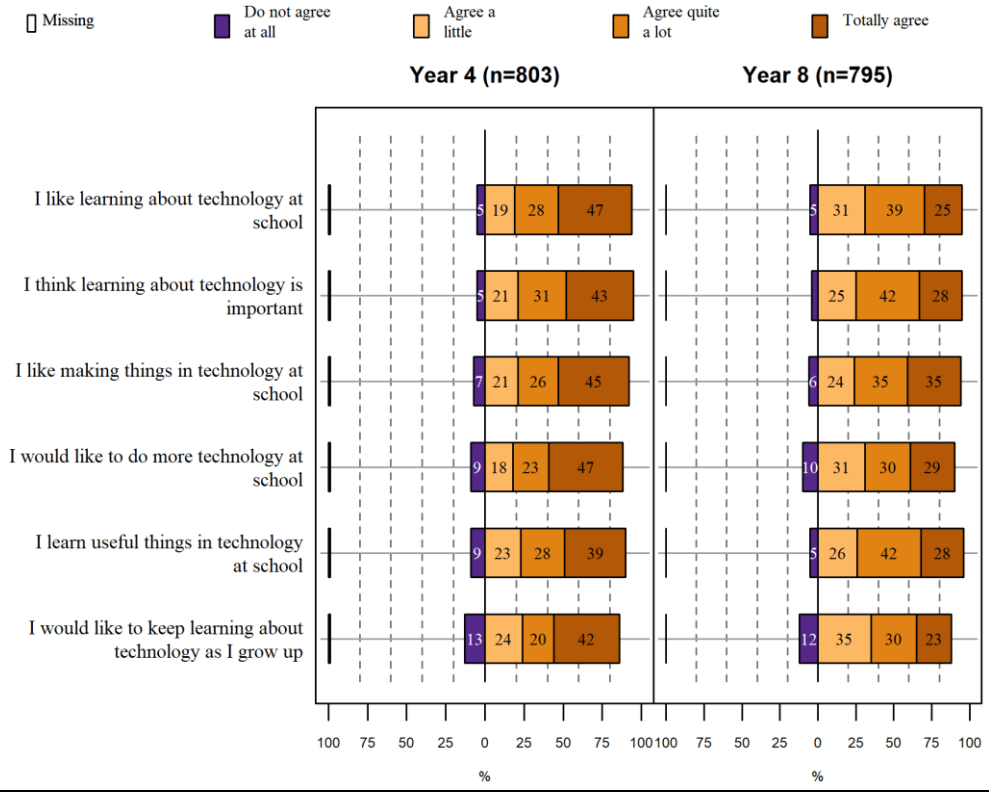

Figure 4.4 Percentage of student responses to statements about their Attitude to technology, by year level

Students' responses to the individual attitude statements were used to construct an IRT scale. The scale was called the Attitude to technology (ATT) scale and was divided into three broad regions. The regions indicate the locations on the scale where students were typically 'very positive', 'positive' and 'not positive' in their responses.[13] Figure 4.5 shows the distribution of ATT scale scores at Year 4 and Year 8.

On average, Year 4 students were more positive about technology than Year 8 students

Year 4 students scored higher, on average, than Year 8 students on the ATT scale by about 5 scale score units. This result was statistically significant. It is different to 2016 when students in Years 4 and 8 were found to have similar attitudes towards technology, but more in line with NMSSA results in other areas. For example, Year 4 students were found to have more positive attitudes than Year 8 students in English in 2019 and in Mathematics and Statistics in 2018.

[13] Students located in the 'very positive' region are most likely to have selected 'totally agree' for the majority of statements, students located in the 'positive' region are most likely to have selected 'agree a little' or 'agree a lot' for the majority of statements, and students located in the 'not positive' region are most likely to have selected 'do not agree at all' for the majority of statements.

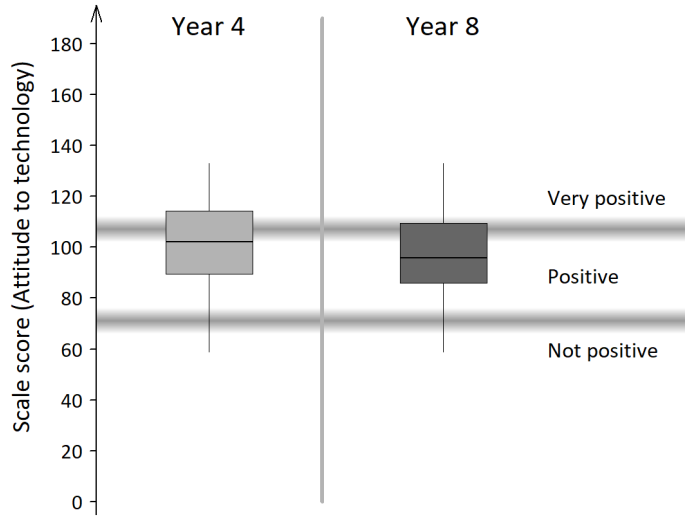

Figure 4.5 Distribution of scores on the Attitude to technology scale, by year level

The distributions of students' scores on the ATT scale were compared, for a range of student characteristics. Figures 4.6 and 4.7 show these results for students in Years 4 and 8, respectively.

Students' attitudes to technology varied by gender

Within the sample, boys scored higher on average than girls on the ATT scale. A difference of 7 scale score units was found at Year 4 and a difference of 6 units at Year 8. This indicates that at both Years 4 and 8, boys have more positive attitudes to technology than girls. No notable differences by gender were found.[14]

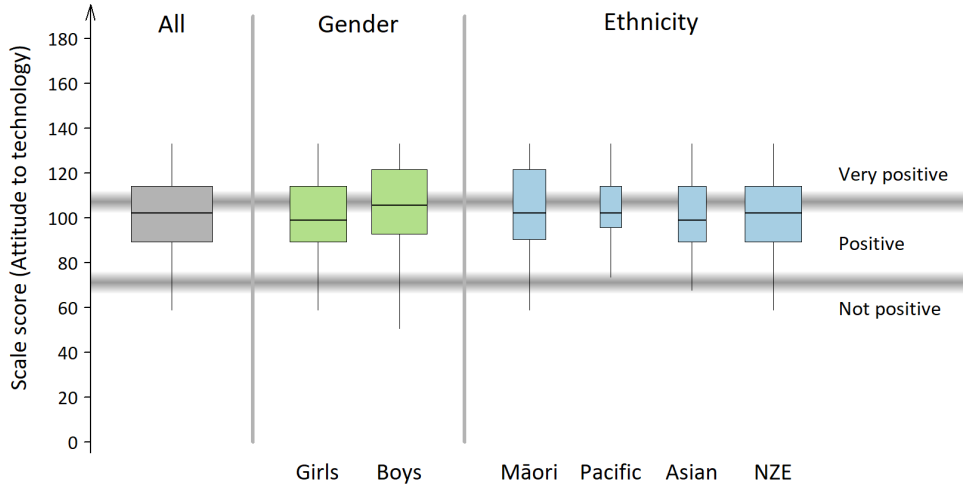

Figure 4.6 Distribution of Year 4 students scores' on the Attitude to technology scale, by gender and ethnicity

[14] Differences between sub-groups are reported when the 95% confidence interval for means of the two groups is not overlapping.

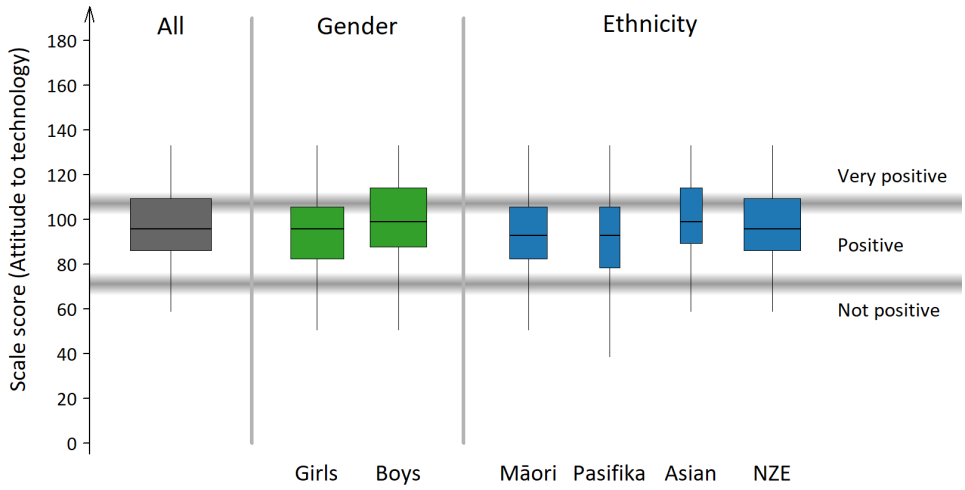

Figure 4.7 Distribution of Year 8 students scores' on the Attitude to technology scale, by gender and ethnicity

The results from the study showed an association between students' attitudes to technology and their achievement in technology. Students with low sores on the ATT scale also tended to achieve lower scores on the TELI assessment.

Students' confidence in technology

Students were asked to indicate their level of agreement with each of a series of statements about their confidence in technology. Figure 4.8 shows the responses of students in Years 4 and 8.

Students were generally confident about their learning in technology

Students at both year levels were generally confident about their learning in technology, with most students indicating that they agree at least 'a little' with all of the statements. Students at both year levels appeared least confident in their ability to write a good design brief (24 percent of Year 4 students and 20 percent of Year 8 students 'do not agree at all') and most confident in their ability to design a solution to solve a problem (12 percent of Year 4 students and 9 percent of Year 8 students 'do not agree at all').

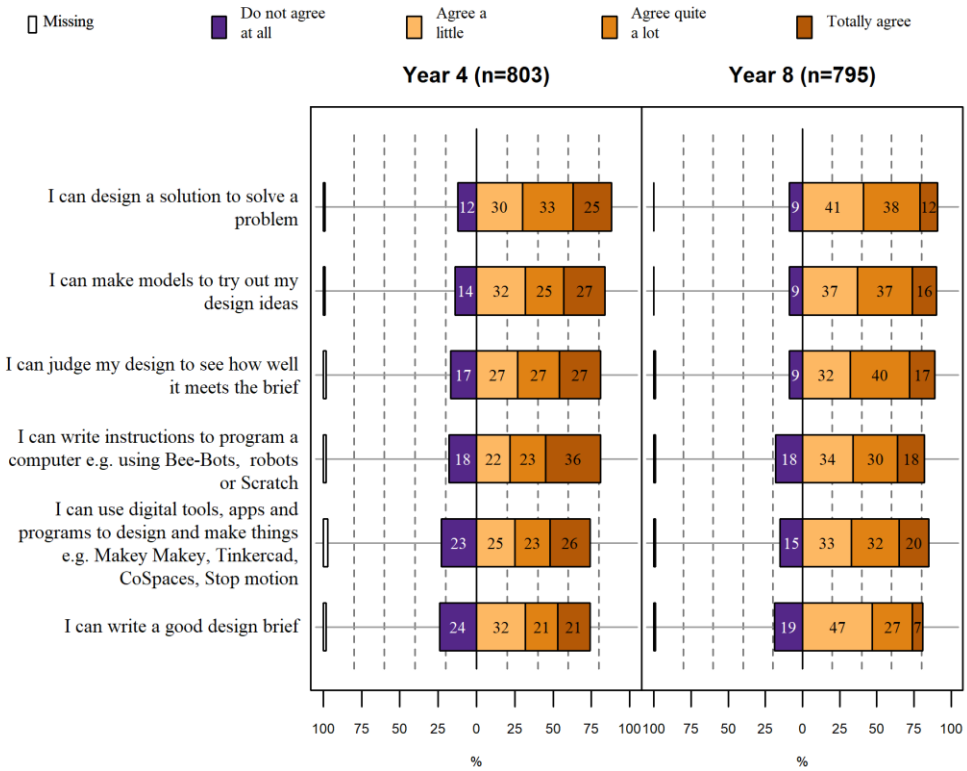

Figure 4.8 Percentage of student responses to statements about their confidence in technology, by year level

The students' responses to the six confidence items were used to construct a Confidence in technology scale (CIT) using IRT. To aid the interpretation of findings, the scale was divided into three score ranges which indicate whether students were typically 'very confident', 'confident' or 'not confident' in their responses[15]. Figure 4.9 shows the distribution of scores on the CIT scale for Year 4 and Year 8 students.

On average, Year 4 students and Year 8 students had similar levels of confidence about their leaning in technology

On average, Year 4 students scored more highly than Year 8 students on the CIT scale, but the result is not statistically significant. This result is different to 2016, when Year 4 students scored more highly than Year 8 students on the confidence scale and the difference was statistically significant.

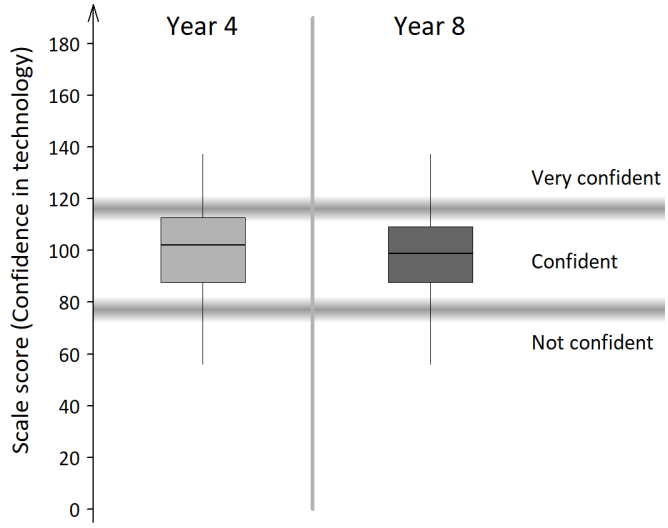

Figure 4.9 Distribution of scores on the Confidence in technology scale, by year level

The distributions of students' scores on the CIT scale were compared, for a range of student characteristics. Figure 4.10 shows these results for students in Years 4, and Figure 4.11 shows these results for students in Year 8.

Students indicated a similar level of confidence in technology across population subgroups

Any differences in the average confidence scores associated with gender, ethnicity, school decile and school type were not statistically significant. In 2016, on average, boys scored more highly on the CIT scale at both Years 4 and 8, and, on average, students in intermediate schools scored more highly on the CIT scale than students at composite or secondary schools.

[15] Students located in the 'very confident' region are most likely to have selected 'totally agree' for the majority of statements; students located in the 'confident' region are most likely to have selected 'agree a little' or 'agree a lot' for the majority of statements; and students located in the 'not confident' region are most likely to have selected 'do not agree at all' for the majority of statements.

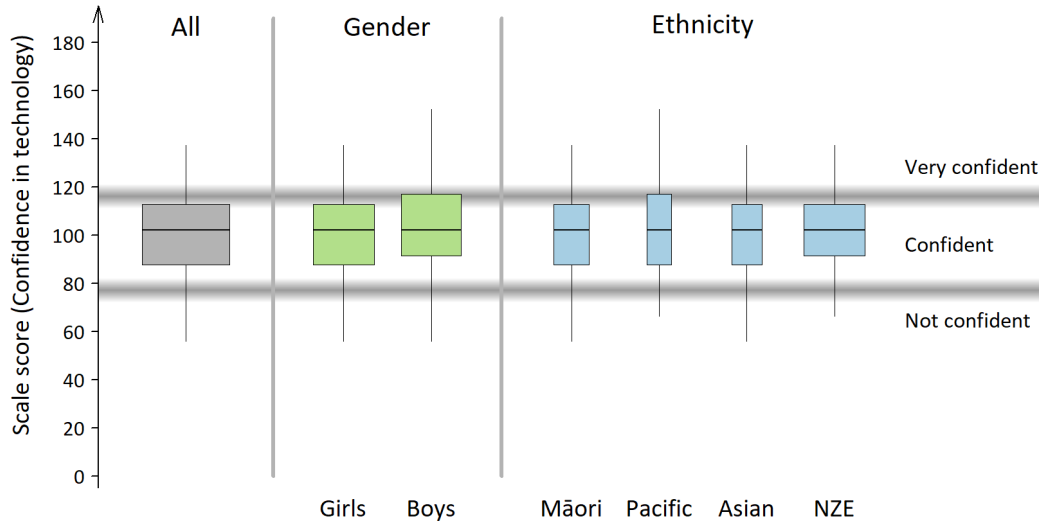

Figure 4.10 Distribution of Year 4 students' scores on the Confidence in technology scale, by gender and ethnicity

Figure 4.11 Distribution of Year 8 students' scores on the Confidence in technology scale, by gender and ethnicity

Results from the study showed an association between students' CIT scores and their achievement in technology. Students with low scores on the CIT scale also tended to achieve lower scores on the TELI assessment.

Teachers' attitude and confidence towards technology

Teachers were asked to indicate their level of agreement with three statements about their attitude and confidence towards technology. Results are shown in Figure 4.12.

Almost all teachers thought teaching technology was important

Almost all teachers agreed on the importance of technology. Just 1 percent of teachers at both Years 4 and 8 indicated that they 'disagree' or 'strongly disagree' with the statement 'I think teaching technology is important'.

Teachers' confidence related to teaching and assessing technology was mixed

Most teachers indicated that they 'agree' or 'strongly agree' that they 'feel confident about teaching technology' (81 percent at Year 4 and 82 percent at Year 8).

Results suggest that teachers felt more confident about teaching technology than about assessing technology. This is particularly pronounced at Year 4.

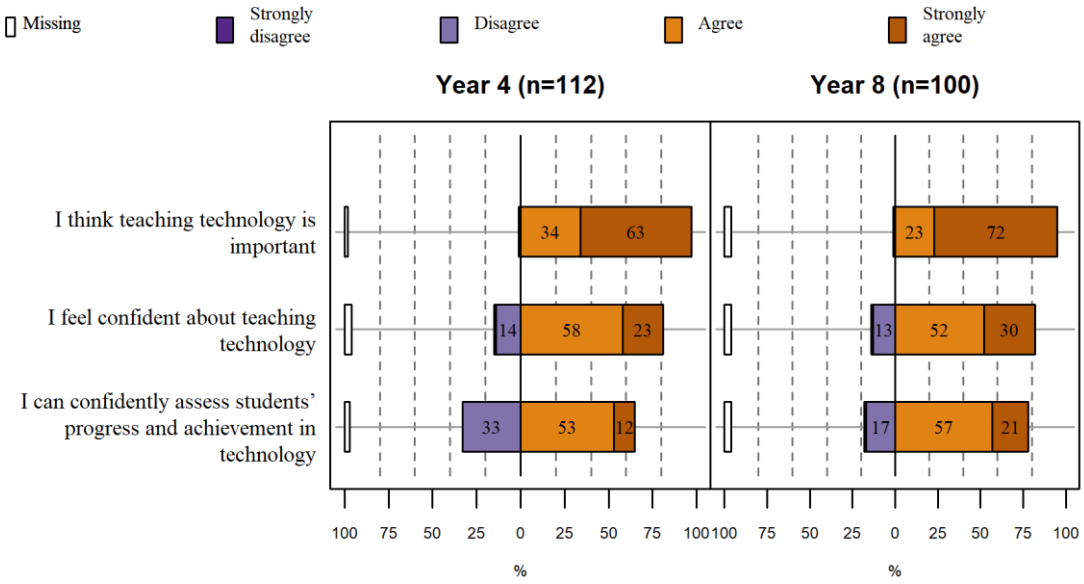

Figure 4.12 Percentage of teacher responses to statements about their attitudes and confidence towards technology, by year level

4. Teaching and learning in technology

This section describes insights into the teaching and learning of technology. It includes students' and teachers' perspectives on the activities provided for students, teachers' reports of the time spent learning technology in school, and principals' views on the teaching and learning of technology in their schools.

Students' reports of the range of technologies experienced

Year 8 students were asked to indicate which technologies they had 'done in school this year'. Table 4.6 shows their responses and compares them with results from 2016.

Year 8 students reported that they had 'done' a variety of technologies in school

Results indicate that in 2021, Year 8 students' learning in technology involved a variety of technological areas. Approximately three-quarters of students noted opportunities in hard/resistant materials (75 percent) and food technology/biotechnology (74 percent), while smaller proportions indicated they had been involved in electronics (38 percent) or media/graphic design (37 percent).

More students reported doing computer programming/coding/robotics and media/graphic design in 2021 than in 2016

More students reported involvement in each of the technologies listed in 2021 than in 2016. Most notably the proportions of students who indicated they had 'done' computer programming/coding/robotics rose from 28 percent in 2016 to 54 percent in 2021, and the proportions of students who indicated they had 'done' media/graphic design rose from 19 percent in 2016 to 37 percent in 2021.

Table 4.6 Percentage of Year 8 students who had 'done' a variety of technologies in school, by year level

	Percentage of Year 8 students		
Technologies[16]	**2021**	**2016**	**Change over time**
Soft materials / textiles	49	48	+1
Hard / resistant materials	75	72	+3
Food technology / biotechnology	74	73	+1
Computer programming / coding / robotics	54	28	+26
Electronics	38	27	+11
Media / graphic design	37	19	+18

Differences in the technologies that Year 8 students had 'done in school this year' by school decile, gender, and ethnicity were investigated. Table 4.7 shows these results.

Fewer students in mid decile schools reported involvement in some areas of technology than students in low or high decile schools

Students at mid decile schools reported notably less frequent involvement in three of the technologies than students at high decile or low decile schools. These technologies were computer programming/coding/robotics, electronics, and media/graphic design.

Table 4.7 Percentage of Year 8 students who had 'done' a variety of technologies in school in 2021, by decile

	Percentage of Year 8 students		
Technologies[17]	**Low decile *N* = 196**	**Mid decile *N* = 365**	**High decile *N* = 234**
Soft materials / textiles	40	51	52
Hard / resistant materials	71	73	81
Food technology / biotechnology	79	70	76
Computer programming / coding / robotics	63	42	65
Electronics	55	27	40
Media / graphic design	29	36	44

No differences in the technologies students were involved in were found by gender or ethnicity.

Students' reports of learning opportunities in technology

Students were asked to rate how often they were involved in a variety of activities to learn technology at school. Figure 4.13 shows the activities that were rated and how students responded, by year level.

Year 8 students reported more frequent opportunities to learn technology at school than Year 4 students

Overall, Year 8 students reported more frequent opportunities to learn technology at school than Year 4 students. Approximately 80 percent of Year 8 students reported that they experienced most of the activities 'sometimes', 'often' or 'very often'. In comparison, around 60 percent of Year 4 students noted experiencing most of the activities 'sometimes', 'often' or 'very often'.

The opportunity to learn technology most frequently reported by Year 4 students was talking about and making models of their design ideas. At Year 8, the most frequently reported learning opportunities included exploring and working with different materials (e.g. textiles, food, wood, or metal). Talking about their own and others' work in technology was reported as happening frequently by students at both year levels. In contrast, the opportunities least frequently reported included looking at and talking about a brief (Year 4), filming and producing a movie (Year 8), and visiting people and places to investigate and learn about technology (Years 4 and 8).

[16] There were small differences in the descriptions of the six technologies between 2016 and 2021. More specifically the 2016 descriptions omitted the words 'soft materials', 'hard materials', coding', and 'graphic design'.

[17] Ibid

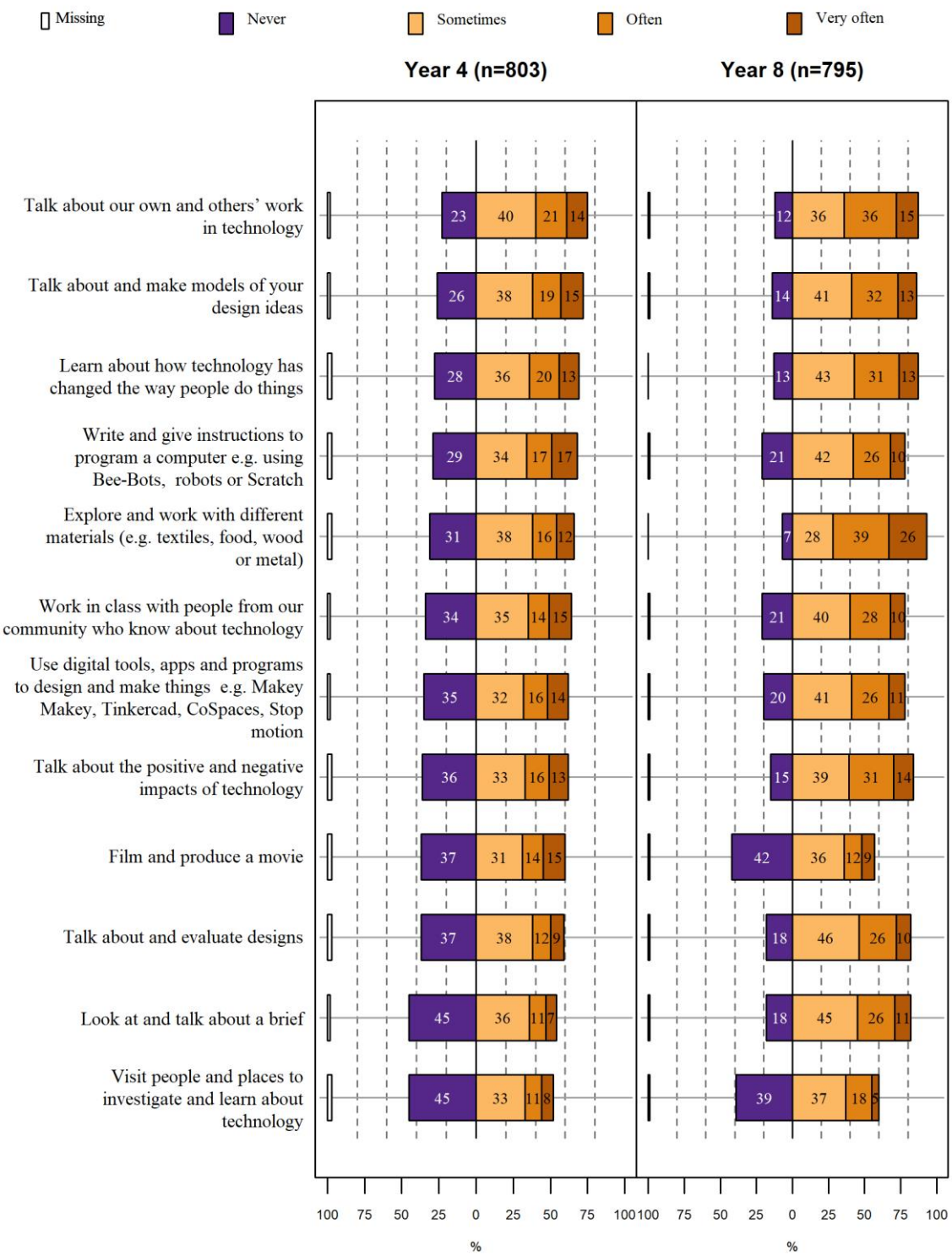

Figure 4.13 Percentage of student responses regarding their involvement in a range of learning opportunities in technology, by year level

Students' opportunities to learn varied minimally by gender, ethnicity, and school decile

The patterns of responses by gender, ethnicity, and decile regarding opportunities to learn technology were very similar to the pattern of responses for all students at both year levels.

One difference was found by decile in students' ratings of the opportunities to learn technology. This involved Year 4 students' reports of how often they 'write and give instructions to program a computer e.g. using Bee-Bots, robots, or Scratch'. Fifty-one percent of students in low decile schools reported doing this 'sometimes', 'often' or 'very often' while 66 percent of students in mid decile schools and 75 percent of students in high decile schools reported the same.

Six items that focused on students' opportunities to learn were used in both 2016 and 2021. Two notable differences in the results over time were identified. Firstly, smaller proportions of students indicated that they 'look at and talk about a brief' in 2021 than in 2016. At Year 4 the proportion of students who reported doing this 'sometimes', 'often' or 'very often' fell from 85 percent to 54 percent, and at Year 8 the proportion fell from 98 percent to 82 percent. Secondly, larger proportions of students in 2021 than in 2016 indicated that they 'work in class with people from our community who know about technology'. The proportion of Year 8 students experiencing this 'sometimes', 'often' or 'very often' rose from 63 percent to 78 percent.

Teachers' reports of learning opportunities in technology

Teachers were presented with the same list of learning opportunities as students (reported on above) and asked to rate how often students in their class had these experiences in technology at school. They were also asked to respond in relation to two additional activities: 'make links with other learning areas (e.g. science and maths) in technology)' and 'work on projects in technology that are connected to their lives and community'. Figure 4.14 shows teachers' responses, by year level.

Year 8 teachers reported more frequent opportunities for their students to learn technology at school than Year 4 teachers

Year 8 teachers reported that their students had more frequent opportunities to learn technology than Year 4 teachers. This is consistent with results from students and may be because Year 8 students spend more time learning technology than Year 4 students. It may also be influenced by the increased use of specialists at Year 8 than at Year 4.

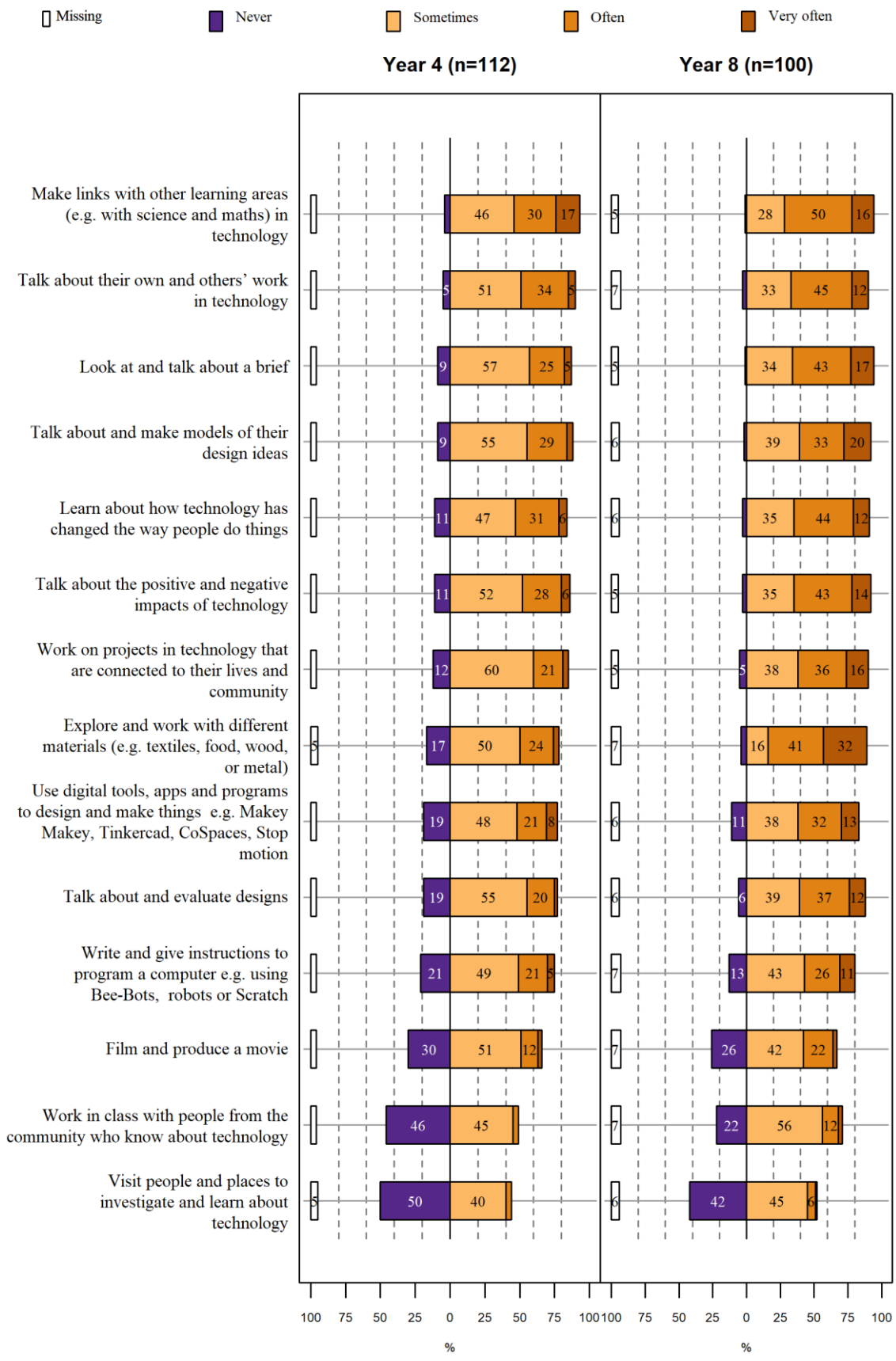

Figure 4.14 Percentage of teacher responses regarding opportunities for students to learn in technology, by year level

Teachers reported more frequent opportunities to learn technology at school than their students

In general, teachers indicated that the students in their classes experienced each of the learning opportunities more often than the students themselves indicated they did. For all but two of the twelve common activities, teachers were more likely than students to report that the activity occurred 'sometimes', 'often' or 'very often'. The differences in students' and teachers' perspectives were greater at Year 4 than Year 8.

Activities for which there were substantial differences in students' and teachers' responses are shown in Table 4.8. The percentages shown are based on the proportions who indicated that the activity occurred 'sometimes', 'often' or 'very often'.

Table 4.8 Differences in teachers' and students' reports of opportunities to learn at school, by year level

	Percentage of teachers and students			
Activities	**Year 4 students**	**Year 4 teachers**	**Year 8 students**	**Year 8 teachers**
Look at and talk about a brief	54	87	82	94
Talk about positive and negative impacts of technology	62	86		
Film and produce a movie			53	66

Teachers' reports of hours spent learning technology

Teachers were asked to indicate approximately how many hours in total their students spend learning technology over the course of a year. Figure 4.15 shows these results.

Teachers report that Year 8 students spend more time learning technology at school than Year 4 students

Year 8 teachers more frequently reported that their students spent more than 40 hours a year learning technology at school than Year 4 teachers. Spending more than 40 hours a year was noted by 66 percent of Year 8 teachers and 21 percent of Year 4 teachers.

This result is consistent with findings from 2016.

No differences by decile were found in teachers' reports of time spent learning technology.

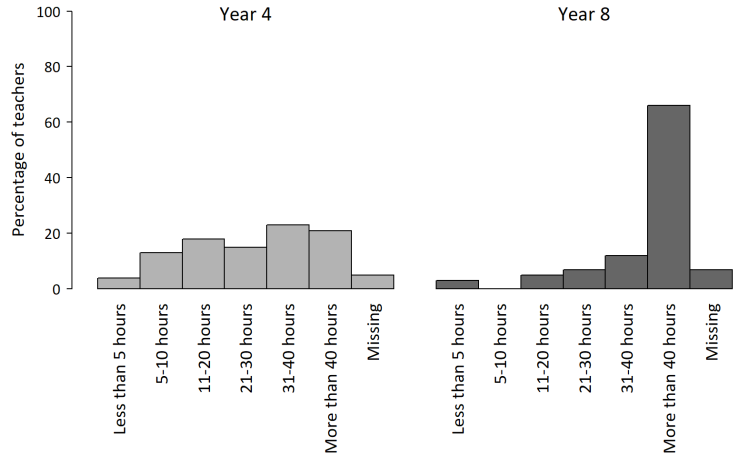

Figure 4.15 Percentage of teachers' responses regarding the amount of time per year students spend learning technology, on average, by year level

Principals' reports related to effective teaching and learning in technology

Principals were asked to indicate the extent to which five statements outlining effective practices in technology described their school. Their responses are shown in Figure 4.16.

Principals were generally positive about the teaching and learning of technology in their school

Almost all principals were positive about teaching and learning in technology at their school. Approximately three-quarters of principals from both Year 4 and Year 8 schools noted that four of the five statements describing effective practice were 'moderately' or 'very' like their school.

Principals from Year 8 schools were more positive than principals from Year 4 schools. Year 8 principals were more likely to rate the effective practice described as 'very like our school' than Year 4 principals for all five statements.

Principals were less positive about the quality of reporting to parents and whānau than they were about other elements of teaching and learning in technology

Principals at both year levels were less likely to indicate that the statement 'parents and whānau are provided with clear information about their child's progress and achievement in technology' was 'moderately' or 'very' like their school than the other statements. Fifty-four percent of principals from Year 4 schools and 68 percent of principals from Year 8 schools indicated that this was the case.

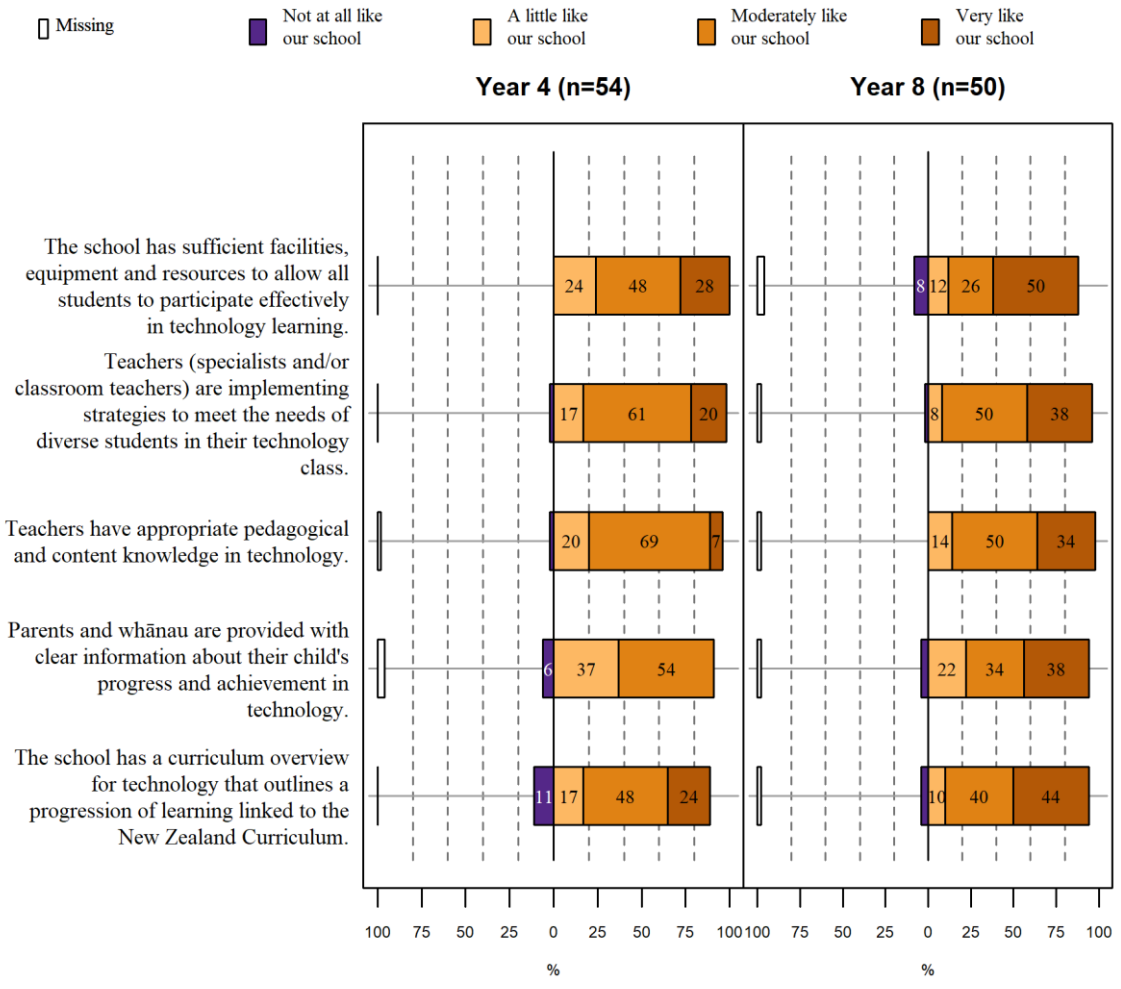

Figure 4.16 Percentage of principals' ratings of statements related to the teaching and learning of technology, by year level

5. Digital technologies

This section reports on schools' experiences with the revised technology learning area. As described in Chapter 2, the technology learning area of the New Zealand Curriculum (NZC) was revised in 2017 to include digital technologies, and the changes have been substantial for schools.

The teachers' responses described in this section are based on the responses of these 67 Year 4 teachers and 54 Year 8 teachers who indicated that they had personally taught the digital technologies curriculum content. Principals' perspectives are also included.

Teachers' perspectives on professional learning and development for digital technologies

Teachers were asked to indicate the professional learning and development (PLD) support focused on the digital technologies curriculum content that they had received. Table 4.9 summarises their responses.

Almost all teachers received PLD support focused on the digital technologies curriculum content

Most teachers at both Year 4 and Year 8 indicated that they had received professional learning and development support focused on the digital technologies curriculum content. Just 7 percent of teachers at Year 4 and 3 percent of teachers at Year 8 noted that they had received no such support.

Teachers reported that school-led PLD was the most common form of support for the digital technologies curriculum content

School-led PLD was the most common form of support for teachers at both Year 4 (75 percent of teachers) and Year 8 (66 percent of teachers). Approximately one-third of teachers also reported receiving support from the Ministry of Education's Kia Takatū ā-Matihiko Digital Readiness Programme.

Table 4.9 PLD support received by teachers for the digital technologies curriculum content, by year level

	Percentage of teachers	
Source of support	**Year 4 Total *N* = 71 %**	**Year 8 Total *N* = 61 %**
The Ministry of Education's Kia Takatū ā-Matihiko Digital Readiness Programme	30	34
School-led PLD	75	66
None	7	3
Other	23	26

A variety of other PLD supports were identified by teachers who indicated that they had received some 'other' form of support than those listed. Centrally funded PLD with an accredited PLD provider was the most commonly identified of these other supports.

Teachers' confidence for teaching digital technologies

Teachers were asked to indicate their level of agreement with three statements about their confidence with the digital technologies curriculum content. Their responses are shown in Figure 4.17.

Teachers were reasonably confident with the new digital technologies curriculum content

Teachers' responses indicated a reasonable level of confidence with the new digital technologies curriculum content. At least 70 percent of teachers at both Years 4 and 8 indicated that they 'agree' or 'strongly agree' with all three confidence statements.

It should also be noted that a non-negligible proportion of teachers lack confidence with digital technologies. Up to 26 percent of Year 4 teachers and 13 percent of Year 8 teachers indicated that they 'disagree' or 'strongly disagree' with the confidence statements.

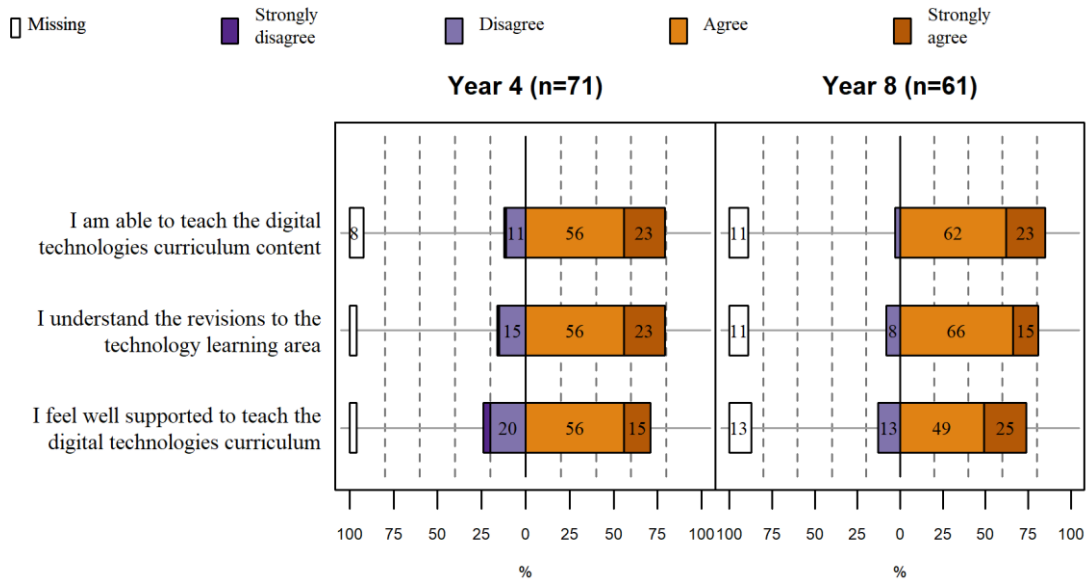

Figure 4.17 Percentage of teacher responses to statements about their confidence with the new digital technologies content, by year level

Teachers' perspectives on the challenges in teaching digital technologies

Teachers were asked to indicate how challenging a range of factors had been for them in teaching the digital technologies curriculum content. Figure 4.18 shows their responses.

Most teachers experienced some level of challenge in understanding the digital technologies curriculum content

The majority of teachers rated each of the seven factors as 'somewhat challenging', 'challenging' or 'very challenging (at least 52 percent of teachers in both Years 4 and 8).

The two factors identified by teachers as most challenging involved using equipment to deliver aspects of digital technologies. These were 'understanding how to deliver aspects of digital technologies without specialist equipment' (71 percent of Year 4 teachers and 71 percent of Year 8 teachers rated this as at least 'somewhat' challenging), and 'understanding how to use specialist equipment to deliver aspects of digital technologies' (73 percent of Year 4 teachers and 68 percent of Year 8 teachers rated this as at least 'somewhat' challenging).

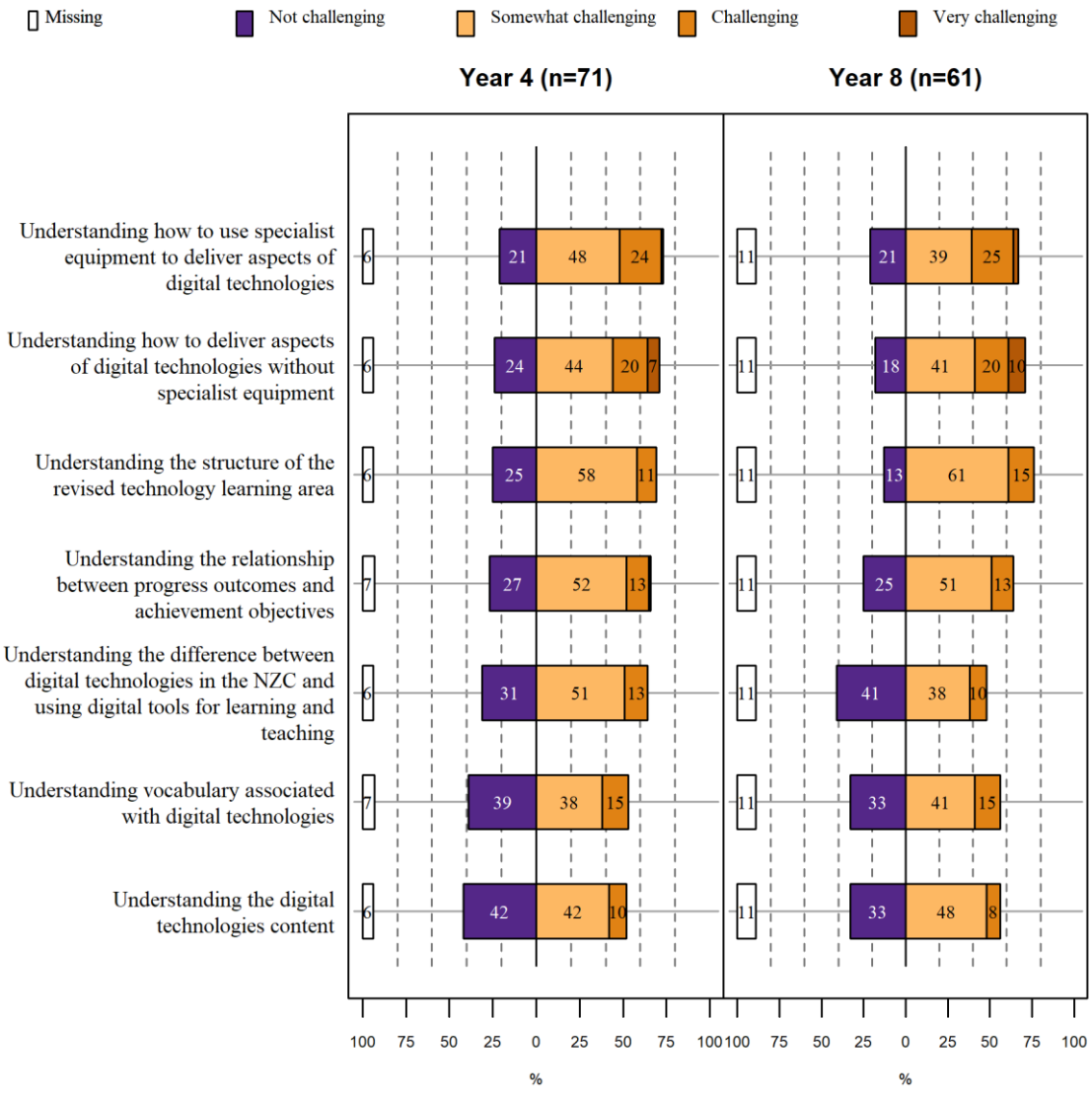

Figure 4.18 Percentage of teacher responses rating the challenges experienced in teaching the digital technologies curriculum content, by year level

Principals' perspectives on planning and assessment processes for digital technologies

Principals were asked to respond to two statements to indicate the extent to which their school had updated their planning and assessment processes to incorporate digital technologies within the learning area of technology. Figure 4.19 shows their responses.

Most principals indicated their school had updated planning and assessment processes to incorporate digital technologies

Almost all of the principals indicated that updating planning processes to incorporate digital technologies was 'a little', 'moderately' or 'very' like their school (93 percent of principals in Year 4 schools and 92 percent of principals in Year 8 school).

Results suggest that schools may have done more to update their planning processes than they have done to update their assessment processes. At Year 4, 76 percent of principals indicated that updated planning processes were 'moderately' or 'very' like their school, while 52 percent indicated that updated assessment processes were 'moderately' or 'very' like their school. Similarly at Year 8, 78 percent of principals indicated that updated planning processes were 'moderately' or 'very' like their school, while 68 percent indicated updated assessment processes were 'moderately' or 'very' like their school.

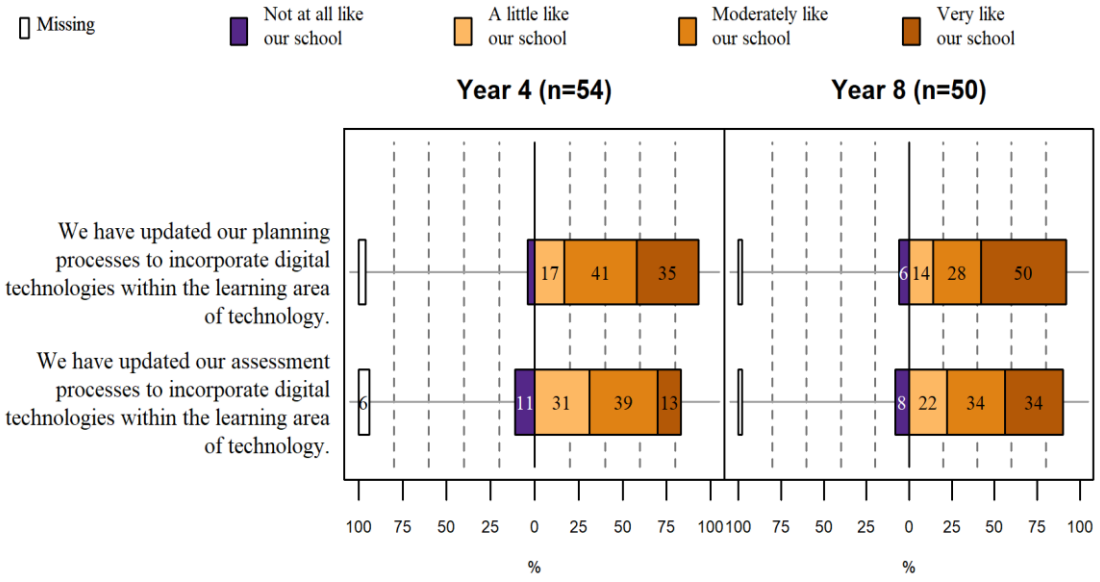

Figure 4.19 Percentage of principals' responses related to the extent to which their school processes were updated to incorporate digital technologies, by year level

Principals' perspectives on the challenges in implementing digital technologies

Principals were asked to indicate how challenging a range of factors had been for their school in implementing the digital technologies curriculum content. Figure 4.20 shows their responses.

Most schools experienced some level of challenge in implementing the digital technologies curriculum content

Most principals rated each of the five factors as 'somewhat challenging', 'challenging' or 'very challenging' (at least 52 percent of principals from both Year 4 and Year 8 schools).

The factor identified by principals as most challenging was 'updating our planning and assessment processes to incorporate digital technologies within the learning area of technology'. Eighty-six percent of principals in Year 4 schools and 78 percent of principals in Year 8 schools rated this 'somewhat challenging', 'challenging' or 'very challenging'.

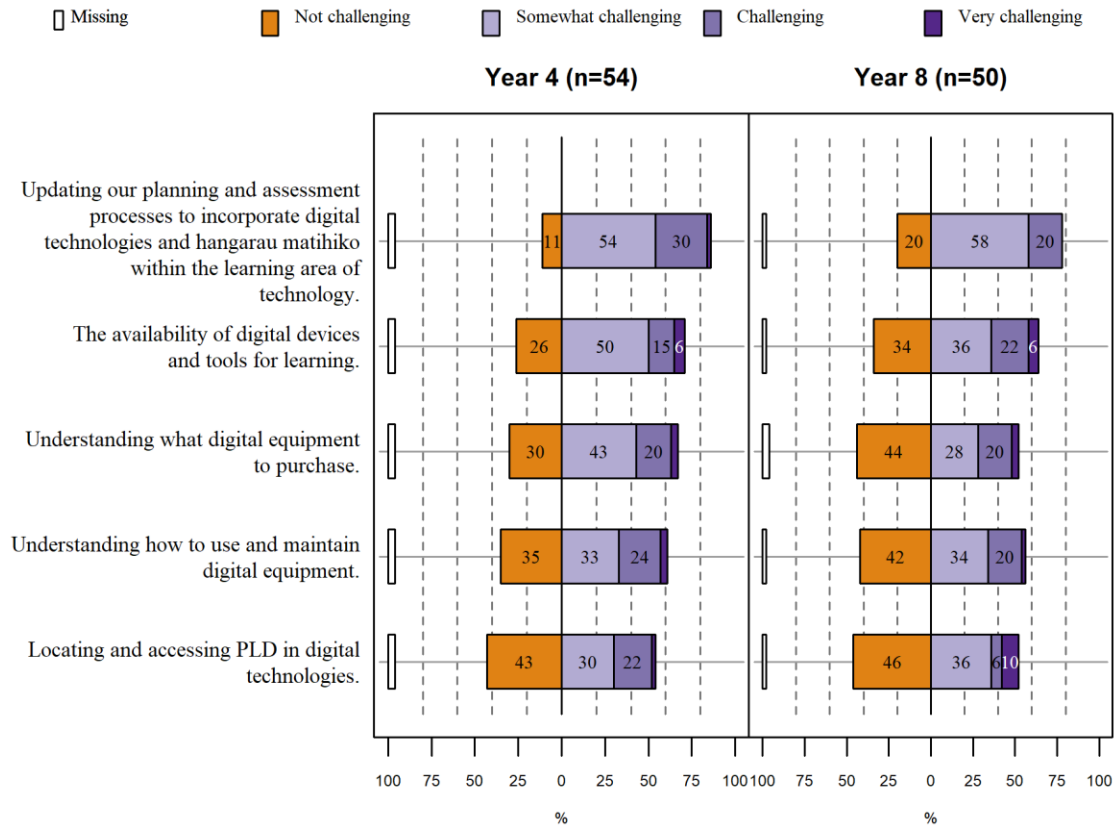

Figure 4.20 Percentage of principals' responses rating the challenges experienced in implementing the digital technologies curriculum content, by year level

Principals' perspectives on teachers' enthusiasm for implementing digital technologies

Principals were asked to rate the overall level of enthusiasm among teachers at their school for implementing the digital technologies curriculum content. Figure 4.21 shows these ratings.

Principals noted some enthusiasm among teachers at their school for implementing the digital technologies curriculum content

Half of the principals indicated that teachers in their school were either 'enthusiastic' or 'very enthusiastic' about implementing the digital technologies curriculum content (50 percent of principals in schools participating at both Years 4 and 8).

Slightly higher levels of enthusiasm were noted at Year 8 than at Year 4. Eighteen percent of principals in schools participating at Year 8 described their teachers as 'very enthusiastic', while 9 percent of principals in schools participating at Year 4 noted this level of enthusiasm.

In addition, most principals noted that their school has an in-school champion who raises the profile of digital technologies and helps drive the engagement of other teachers (81 percent of principals in Year 4 schools and 80 percent of principals in Year 8 schools).

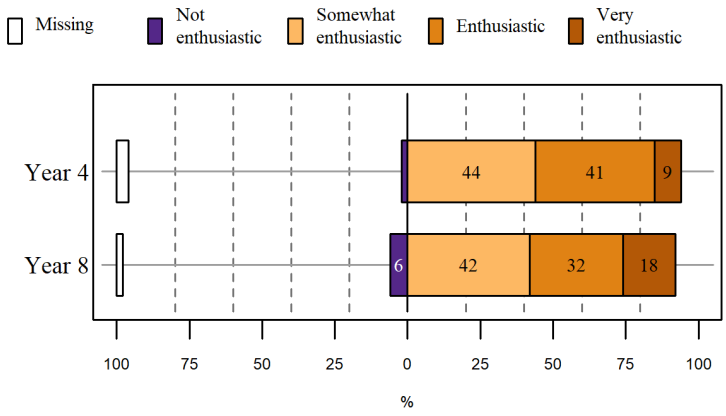

Figure 4.21 Percentage of principals' responses rating teachers' enthusiasm for implementing the digital technologies curriculum content, by year level

Principals' ratings of overall provision in digital technologies

Principals were asked to rate their school's provision for all Year 4 or Year 8 students learning in the new digital technologies curriculum content. Figure 4.22 shows these ratings.

Principals rated their school's provision for students' learning in the new digital technologies content more highly at Year 8 than Year 4

The principals of schools participating at Year 8 were more positive about their school's provision for student learning in the new digital technologies curriculum content than principals of schools participating at Year 4. Seventy-eight percent of Year 8 principals rated their school's overall provision as 'good' or 'very good', while 56 percent of Year 4 principals gave the same rating. The greater use of specialist teachers of technology at Year 8 than Year 4 could contribute to this finding.

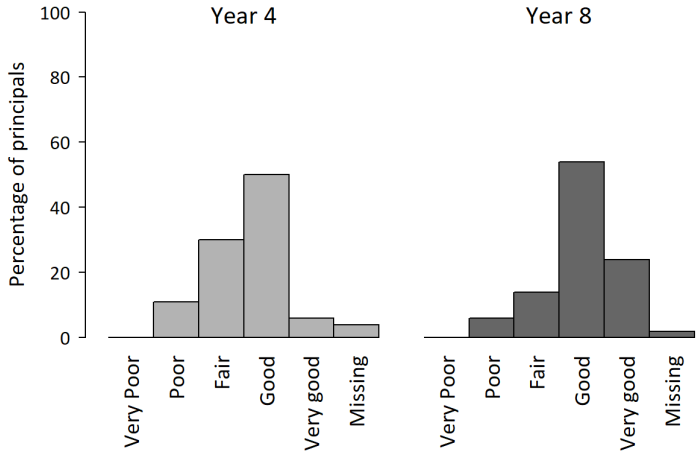

Figure 4.22 Percentage of principals' ratings of their school's overall provision for learning in technology, by year level

Appendix: Summary Statistics

Tables:

Table A1.1. Achievement on the TELI scale: Summary statistics for Year 4 students 49

Table A1.2. Achievement on the TELI scale: Summary statistics for Year 8 students 50

Notes:

Reporting of statistics

The following tables report a range of statistics associated with the 2021 NMSSA technology study.

95 percent confidence intervals

The tables show the 95 percent confidence intervals associated with the statistics. The intervals provide a range within which we can be fairly sure the population value for the reported statistic lies. The confidence intervals have been adjusted (widened) to account for any design effect associated with NMSSA's sampling approach (i.e. sampling schools and then sampling students).

Achievement in the technology learning area

Table A1.1. Achievement on the TELI scale: Summary statistics for Year 4 students

Group	Sample size	Mean	Confidence interval for the mean	Standard deviation
All	1106	84.0	(82.6, 85.4)	19.6
Gender				
Girls	576	86.6	(84.7, 88.5)	19.6
Boys	530	81.2	(79.2, 83.2)	19.3
Ethnicity				
Māori	236	74.9	(72.0, 77.8)	19.1
Pacific	108	68.3	(63.6, 73.0)	20.4
Asian	167	87.4	(84.3, 90.5)	17.1
NZE	705	87.8	(86.2, 89.4)	18.3
SEN (combined)	114	69.8	(65.4, 74.2)	19.9
Decile band				
Low decile	166	70.1	(66.5, 73.7)	19.8
Mid decile	460	82.1	(80.0, 84.2)	18.8
High decile	480	90.7	(88.9, 92.5)	17.2
School type				
Contributing	757	84.2	(82.5, 85.9)	19.6
Full primary	349	83.6	(81.1, 86.1)	19.5

Table A1.2. Achievement on the TELI scale: Summary statistics for Year 8 students

Group	Sample size	Mean	Confidence interval for the mean	Standard deviation
All	1105	116.0	(114.6, 117.4)	20.4
Gender				
Girls	522	119.8	(117.7, 121.9)	20.1
Boys	583	112.6	(110.6, 114.6)	20.1
Ethnicity				
Māori	297	106.0	(103.4, 108.6)	18.7
Pacific	84	100.2	(95.2, 105.2)	19.2
Asian	121	122.0	(117.7, 126.3)	19.7
NZE	748	119.8	(118.2, 121.4)	19.0
Special education needs				
SEN (combined)	102	102.5	(97.8, 107.2)	19.9
Decile band				
Low decile	255	103.9	(101.0, 106.8)	19.6
Mid decile	468	116.4	(114.3, 118.5)	19.4
High decile	382	123.6	(121.4, 125.8)	18.2
School type				
Composite	34	120.5	(113.2, 127.8)	17.2
Full primary	449	114.5	(112.3, 116.7)	19.8
Intermediate	461	114.8	(112.5, 117.1)	21.2
Restricted composite	18	125.0	(113.8, 136.2)	18.2
Secondary	143	122.2	(118.4, 126.0)	19.2

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