NMSSA

Wānangatia te Putanga Tauira

National Monitoring Study of Student Achievement

Technical Information 2016

Learning Languages • Technology

TECHNICAL INFORMATION 2016 – Learning Languages • Technology

Report 15

Wānangatia te Putanga Tauira

National Monitoring Study of Student Achievement

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Educational Assessment Research Unit
and
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- the students who participated in the assessments and their parents, whānau and caregivers
- the teachers who administered the assessments to the students
- the teachers and senior initial teacher education students who undertook the marking
- the Ministry of Education Research Team and Steering Committee.

Appendix 1:
Sample Characteristics for 2016

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Samples for 2016

A two-stage sampling design was used to select nationally representative samples of students at Year 4 and at Year 8. The first stage involved sampling schools, and the second stage involved sampling students within schools.

A stratified random sampling approach was taken with the intention of selecting 100 schools at Year 4 and 100 schools at Year 8. A maximum of 27 students were randomly selected from each school to form a national sample of approximately 2,300 students at Year 4 and 2,300 students at Year 8.

To ensure that the 2016 student sample was nationally representative the Ministry of Education July 2015 school returns for Year 3 and Year 7 were used to inform the selection of Year 4 and Year 8 schools in 2016.

1. Sampling of schools

Sampling algorithm

From the complete list of New Zealand schools select two datasets – one for Year 3 students and the other for Year 7 students.

For the Year 3 sample:

- Exclude:
    - schools which have fewer than eight Year 3 students
    - private schools
    - special schools
    - Correspondence School
    - Kura Kaupapa Māori
    - trial schools
    - Chatham Island schools.
- Stratify the sampling frame by region and quintile[1].
- Within each region-by-quintile stratum, order the schools by Year 3 roll size[2].
- Arrange the strata alternately in increasing and decreasing order of roll size[3].
- Select a random starting point.
- From the random starting point, cumulate the Year 3 roll.
- Because 100 schools are required in the sample, the sampling interval is calculated as:

$$\frac{\text{Total number of Year 3 students}}{100}$$

- Assign each school to a "selection group" using this calculation:

$$Selection\ group = ceiling\left(\frac{cumulative\ roll}{sampling\ interval}\right)$$

- Select the first school in each selection group to form the final sample.

Follow the same process for the Year 7 sample.

If a school is selected in both the Year 3 and Year 7 samples, randomly assign it to one of the two samples. Locate the school in the unassigned sample and select a replacement school (next on list). Repeat the process for each school selected in both samples.

1 Decile 1 and 2 comprises Quintile 1; Decile 3 and 4 comprises Quintile 2; Decile 5 and 6 comprises Quintile 3; Decile 7 and 8 comprises Quintile 4; and Decile 9 and 10 comprises Quintile 5.

2 Roll size refers to the year level in question e.g. roll size for Year 3 students.

3 This is done so that when replacements are made across stratum boundaries the replacement school is of a similar size to the one it is replacing.

2016 NMSSA sample

The sampling frames constituted 1491 schools for Year 3 and 943 schools for Year 7 after exclusions had been applied. No schools were listed in both samples.

Selected schools were first invited to participate in January, 2016. Therefore 'Year 3 schools' became 'Year 4 schools' and similarly 'Year 7 schools' became 'Year 8 schools'. Those that declined to participate were substituted using the following procedure:

- From the school sampling frame, select the school one row below the school withdrawn.
- If this school is not available, re-select by going to one row above the school withdrawn.
- If this school is not available, select the school two rows below the school withdrawn. Continue in this sequence until a substitute is found.

In total, 22 schools at Year 4 and 23 schools at Year 8 declined to participate. Replacement schools were found for all schools either on the first attempt (Year 4: 18 and Year 8: 14), second attempt (Year 4: 3 and Year 8: 8) or third attempt (Year 4:1 and Year 8:1).

Achieved samples of schools

The achieved sample of 100 schools at Year 4 and 100 schools at Year 8 represented a response rate of 79 percent at Year 4 and 75 percent at Year 8.[4]

2. Sampling of students

When schools agreed to participate in the programme, they were asked to provide a list of all Year 4 (or Year 8) students, identifying any students for whom the experience would be inappropriate (e.g. high special needs (ORS), very limited English language (ESOL), Māori Immersion level 1, would be absent during the visit, had left the school, other health or behavioural issues).

Two intersecting samples were required for the assessment programme:

- A group-administered task (GAT) sample including up to 27 students per school. These students completed GATs (assessments in technology and te reo Māori, and questionnaires in technology and learning languages).
- A subset of eight of these students formed the in-depth (InD) sample that undertook practical tasks in technology.

The procedure for selecting students for the GAT and InD samples was as follows:

- Each school provided a list of all students in their school at Year 4 or Year 8 in 2016. A computer-generated random number between 1 and 1 million was assigned to each student. Students were ranked in order of their random number from lowest to highest.
- The first 27 students in the ordered list were identified as belonging to the GAT sample. The first eight students were identified as also belonging to the InD sample.
- The draft school lists of selected students were returned to schools for approval. Principals were given a second chance to identify students for whom the NMSSA assessment would be inappropriate. Any identified students in the GAT sample were replaced with students ranked 28 onwards from the initial list with earlier rankings 'bumped up', so there were no missing ranks and the maximum GAT sample remained at 27. The resultant list was confirmed and letters of consent were sent to the parents of selected students (via the schools, on our behalf).

[4] School response rate is defined as the number of schools that participated (the achieved sample) as a percentage of the total number of schools invited to participate including those accepted for the study.

- The children of parents who declined to have their child participate were withdrawn from the list and were replaced in the same way as above – until lists were "locked in" to the master laptop. After this, further replacement students were numbered 28+, with the withdrawn student keeping their existing number, but having a notation that they had been withdrawn. The multiTXT system was used to advise the relevant TA that the student list had changed since the one provided at the training week. No replacements were added within two weeks of the date of the school visit, as there was insufficient time to seek parental permission.
- On the day before arrival in each school, TAs checked the final student list.
- On-site replacements of students by TAs were made if:
    - Any of students 1-8 (the InD sample) were absent or withdrawn (e.g. by the principal) on the first day, prior to the start of assessments. They were replaced by students ranked 9-27, on a best-match basis (e.g. using our gender/ethnicity replacement priorities).
    - All other students (up to 27) participated in GATs in technology and te reo Māori assessments and questionnaires.

  Note: If students were absent or withdrawn (e.g. by the principal) after the start of the assessment programme, no replacements were made.

The following sections describe the achieved GAT and InD samples of students at Year 4 and Year 8 and contrast their demographic characteristics with those of their respective national populations. This allows us to determine the national representativeness of the samples.

GAT and InD samples

This section describes the achieved sample of students at Year 4 and Year 8 for the GAT and InD samples.

Achieved samples at Year 4

Table A1.1 shows that at Year 4 the intended sample was 2,733 randomly selected students. Principals identified 347 students for whom the experience would be unsuitable. The 'eligible' sample was reduced to 2,386. A further 48 students were withdrawn from the study by the principal or parents after the sample was drawn. Substitutes were selected for 164 students. A further 156 students withdrew late, were absent or did not respond for other reasons during the assessment period. The achieved GAT sample included 2,348 students, representing a participation rate of 85 percent[5]. The achieved InD sample included 791 students, representing a participation rate of 99 percent.

Table A1.1 The selection of Year 4 students for the GAT and InD samples

	GAT - N	InD - N
Intended sample of students	**2,733**	**800**
Students withdrawn by principal before sample selected	-347	
Eligible sample	**2,386**	**800**
Students withdrawn by parents or principal after sampling	-48	
Substitute students used	164	
Late withdrawals	-42	
Absences/non-responses during assessment period	-114	9
Achieved sample	**2,346**	**791***

* In-depth sample for both assessment tasks

5 Student response rate is defined as the number of students that participated (the achieved sample) as a percentage of the total number of students in the eligible sample, students withdrawn, substitutes and withdrawals.

Table A1.2 contrasts the characteristics of the samples with the population.

Table A1.2 Comparison of the GAT and InD samples with population characteristics at Year 4

	Population (%)	GAT sample *N* = 2,346 (%)	InD sample *N = 598* (%)
Gender			
Boys	51	51	52
Girls	49	49	48
Ethnicity			
European	52	54	55
Māori	24	21	21
Pasifika	10	11	11
Asian	10	12	11
Other	1	2	3
School Quintile			
1	17	16	17
2	17	18	17
3	16	15	17
4	22	19	20
5	28	31	29
School Type			
Contributing (Year 1-6)	61	67	65
Full Primary (Year 1-8)	36	32	34
Composite (Year 1-10 & 1-13)	4	1	1
MOE Region			
Auckland	36	39	37
Bay of Plenty/Rotorua/Taupo	8	9	9
Canterbury	12	10	10
Hawkes Bay/Gisborne	5	6	5
Nelson/Marlborough/West Coast	4	4	4
Otago/Southland	6	5	5
Tai Tokerau (Northland)	4	3	3
Taranaki/Whanganui/Manawatu	7	8	9
Waikato	9	7	7
Wellington	11	10	11

Note: Rounding to integers means that percentages do not always add up to 100 percent.

Achieved samples at Year 8

Table A1.3 shows that at Year 8 the intended sample was 2,760 randomly selected students. Principals identified 384 students for whom the NMSSA assessment experience would be unsuitable. The 'eligible' sample was reduced to 2,376. A further 45 students were withdrawn from the study by the principal or parents after the sample was drawn. Substitutes were selected for 161 students. A further 199 students withdrew late, were absent or did not respond for other reasons during the assessment period. The achieved GAT sample of 2,293 students represented a participation rate of 82 percent. The achieved InD sample included 797 students representing a participation rate of 99.6 percent.

Table A1.3 The selection of Year 8 students for the GAT and InD samples

	GAT - *N*	**InD - *N***
Intended sample of students	**2,760**	**800**
Students withdrawn by principal before sample selected	-384	
Eligible sample	**2,376**	**800**
Students withdrawn by principals or parents after sampling	-45	
Substitute students used	161	
Late withdrawals	-43	3
Absences/non responses during assessment period	-156	
Achieved sample	**2,293**	**797**

Note: Rounding to integers means that percentages do not always add up to 100 percent.

Table A1.4 contrasts the characteristics of the samples with the population.

Table A1.4 Comparison of the GAT and InD samples with population characteristics at Year 8

	Population (%)	GAT sample *N* = 2,295 (%)	InD sample *N* = 598 (%)
Gender			
Boys	51	52	51
Girls	49	48	49
Ethnicity			
European	56	55	56
Māori	22	22	23
Pasifika	10	10	10
Asian	9	10	9
Other	1	3	2
School Quintile			
1	14	12	13
2	17	15	16
3	22	23	22
4	24	25	26
5	24	24	24
School Type			
Full Primary (Year 1-8)	35	30	33
Intermediate	46	49	45
Secondary (Year 7-13)	13	16	15
Composite (Year 1-13 & 7-10)	4	6	7
MOE Region			
Auckland	34	39	35
Bay of Plenty/Rotorua/Taupo	8	8	8
Canterbury	12	9	10
Hawkes Bay/Gisborne	5	5	5
Nelson/Marlborough/West Coast	4	5	5
Otago/Southland	6	7	7
Tai Tokerau (Northland)	4	4	4
Taranaki/Whanganui/Manawatu	6	5	7
Waikato	9	9	9
Wellington	12	10	11

Note: Rounding to integers means that percentages do not always add up to 100 percent.

At both year levels, the national GAT and InD samples matched the characteristics of the population acceptably well across a range of key variables. Some small variations were noted between the samples and the respective populations with regard to type of schools and the proportion of schools from the Auckland region.

Appendix 2:
Statistical Considerations

Introduction

Over the first cycle of NMSSA (2012 to 2016), various statistical analysis techniques and methodologies were developed for use with NMSSA data. These include methods for establishing whether we need to apply sample weights, post-hoc stratification, analysis to assess the magnitude of variance inflation (design effect) caused by the cluster sampling methodology employed in NMSSA, and finally the integration of plausible values to enable more accurate national population estimates.

We refer the reader to Appendix 2 in the report *Technical Information 2015* for details of the methodologies described briefly here.

Sample weights in 2016

As in previous years, sample weights were constructed to check for representation of sub-groups of interest: gender and ethnic group. Weights were found to vary within a narrow range around 1. For Year 4, 99 percent of weights lay between 0.7 and 1.3, and for Year 8 nearly 100 percent of weights lay in this range. Application of the weights rendered negligible differences to the main reported statistics, and as in previous years, it was decided that it was not necessary to use weighted data in further analyses.

As the NMSSA sample is selected with the same algorithm each year, a nationally representative sample is likely to follow. This being the case, it is unlikely that sample weights will be needed for analysis of NMSSA data unless the sampling methodology changes.

Variance estimation

The NMSSA sample is an implicitly stratified random cluster sample. A clustered sample (compared to a simple random sample) will inflate the variance of population estimates to a greater or lesser degree. In previous rounds of NMSSA it has been recommended that using a single factor to reduce the actual sample size to an *effective sample size* for all estimates will account for most of the variance inflation.

In 2016, the effective sample size factor is 0.7. For all calculations of statistics involving sample size (variance, confidence intervals and effect sizes) the actual sample size is replaced with 0.7 * sample size.

Plausible values

Plausible values are useful where a large number of students have completed assessments that have a small number of score points, and we want to report population statistics accurately. When assessments have a low number of score points, the population of achievement scores is described by a constrained number of points on the continuous latent trait scale.

Plausible values are imputed values that resemble individual achievement scores and have approximately the same distribution as the latent trait being measured. They represent random draws from an empirically derived distribution of achievement estimates, and population statistics can be recovered more accurately than they would be by simply using the observed set of achievement scores.

In NMSSA 2017, plausible values were generated for estimates of achievement in te reo Māori, and technology.

Appendix 3:
Curriculum Alignment of NMSSA Technology 2016

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1. Introduction and background

The underlying objective of NMSSA is to report on student achievement with respect to the New Zealand Curriculum (NZC). To accomplish this, assessment data in relevant learning areas is collected each year, and achievement scales are constructed. The scales are then aligned with the levels of the NZC.

In 2016, the learning areas of interest were technology and learning languages (which included a measure of achievement in te reo Māori). Achievement in technology and te reo Māori were measured with group-administered tasks mainly presented by computer, and in technology, also with individual tasks involving hands-on activities. Both group-administered assessments included a mixture of selected-response and constructed-response questions. Curriculum alignment was undertaken for technology only; for the measure of achievement in re reo Māori, score range bands were defined within level 1 of the NZC.

This appendix describes the process followed and presents results for the curriculum alignment of the Technological Literacy (TELI) scale. Many features of a curriculum alignment exercise are the same regardless of the learning area. In NMSSA the goal is the same across all learning areas – to align the relevant scale with the levels of the NZC, paying particular attention to level 2 and level 4.

An alignment of an achievement scale to the NZC has not been attempted before in this learning area. The process described here has generated some useful discussion and learning particularly in regard to how conceptual understanding is 'measured' in a national monitoring context.

Figure A3.1 shows a high-level overview of NMSSA assessment development. This appendix addresses the transition from 'NMSSA Scales' to 'New Zealand Curriculum'.

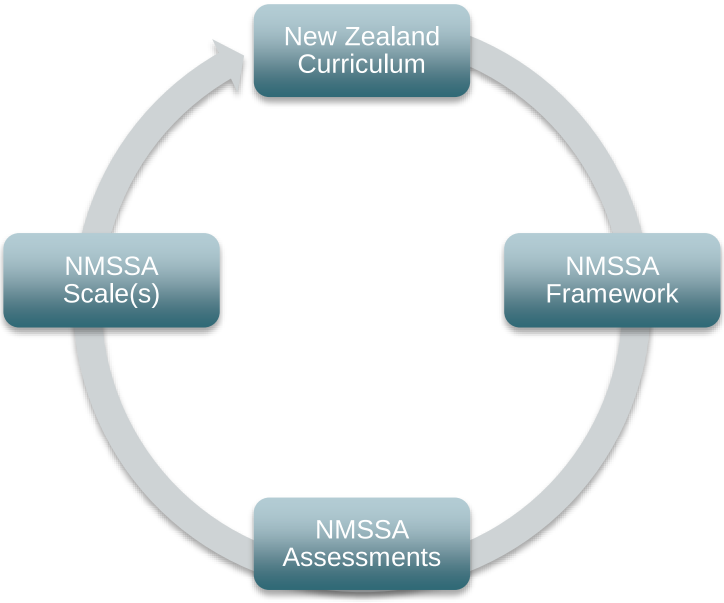

Figure A3.1 Overview of the NMSSA process

2. Technology assessment

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

The technology assessment included the three technology strands: technological practice (knowing how to plan for practice, develop a brief and evaluate a range of outcomes); technological knowledge (knowing what key concepts underpin technological development and outcomes) and nature of technology (knowing why technology is influenced by, and influences, historical, social and cultural events). Collectively, this assessment was called Techological Literacy (TELI). It is important to note that some aspects of the technological practice strand were not able to be asssessed in NMSSA given the extended developmental process required to fulfil some aspects of the strand.

Administration

Experienced, specially trained classroom teachers conducted the assessments during Term 3. Up to 27 students in each school were each provided with a laptop computer to complete one of the booklets in groups of up to five, supervised by a teacher assessor. About 2,300 students at each of Year 4 and Year 8 completed the group-administered technology assessment and 800 students at each year level completed the hands-on manipulation tasks.

Some of the group-administered tasks were developed to be administered by computer with students responding either on the computer (for example, selected response and matching questions) or on paper (where longer written answers were required). Some tasks required a hands-on manipulation of technology products and then a response to questions on paper. Four sets of booklets at Year 4 and Year 8 each consisted of five to seven stimulus tasks and a selection of questions to accompany each task. The forms were linked to allow the construction of the TELI scale describing progress according to the NZC.

The Technological Literacy (TELI) scale was constructed from student responses to the technology assessment.

3. Alignment to the NZC

A group of technology curriculum experts was invited to participate, as part of a panel, in the alignment exercise. The panel was made up of eight members who provided curriculum expertise, together with research, classroom and teaching experience in technology. The alignment exercise took the form of a day-long workshop. NMSSA researchers, psychometricians and a Ministry of Education representative also formed part of the alignment team.

Knowledge of the scale

The panel was presented with detailed information to help them gain a thorough understanding of the assessment framework, and its relationship to the TELI scale. Questions and discussion were encouraged at all times. Both substantive and psychometric aspects of the scale were examined in some detail. This was a critical step in the alignment exercise and considerable time was spent ensuring that the panel was equipped to make consistent and informed judgements about the relationship of the scale to the relevant curriculum levels.

Experience of the assessments

The panel had the opportunity to experience assessments as students had experienced them in the NMSSA main study. Technology resources and exemplars used during the assessment were provided and assessment tasks were presented on laptops. The relative difficulty and cognitive demands of each item were examined and discussed.

Structure

The technology curriculum aligment exercise was undertaken in four sessions. To allow every member of the panel to share their ideas with everybody else for each task, tasks and group membership were altered across sessions. Table A3.1 shows the structure for the day. A panel member is referred to a ‘Judge’.

Table A3.1 Structure for the alignment exercise

	GROUP 1		GROUP 2	
Session 1	Judge 1	Judge 2	Judge 5	Judge 6
	Judge 3	Judge 4	Judge 7	Judge 8
	Task 1, Task 2		*Task 1, Task 2*	
MORNING BREAK				
Session 2	Judge 1	Judge 2	Judge 3	Judge 4
	Judge 5	Judge 6	Judge 7	Judge 8
	Task 3, Task 4, Task 5		*Task 6, Task 7, Task 8*	
LUNCH BREAK				
Session 3	Judge 1	Judge 2	Judge 3	Judge 4
	Judge 5	Judge 6	Judge 7	Judge 8
	Task 6, Task 7, Task 8		*Task 3, Task 4, Task 5*	
AFTERNOON BREAK				
Session 4	Judge 1	Judge 3	Judge 2	Judge 4
	Judge 5	Judge 7	Judge 6	Judge 8
	Task 9, Task 10		*Task 9, Task 10*	

4. Alignment process

Technology units (tasks and all related questions) were presented to the panel on laptops one by one. Judgements were made by the panel, as to how pre-defined groups of students would have responded to each item.

Each panel member was asked to estimate a distribution of responses to each question. This method of alignment requires defining of minimal competence, and consideration of the influence of assessment conditions on student performance. These are discussed below, followed by an outline of the unique elements of the alignment method.

Minimal competence at different curriculum levels

The panel was asked to imagine a large group of students achieving at the lower threshold of curriculum level 2, and another large group achieving at the lower threshold of curriculum level 4. These students were to be considered minimally competent at their respective curriculum levels.

In assisting the panel to conceptualise these groups, 'minimal competence at a curriculum level' was thoroughly discussed and the panel worked towards a common understanding of the concept.

A number of definitions of minimal competence were considered. Panel members were encouraged to use the definition(s) that best helped them imagine these groups. The following definitions were discussed for level 2.

- A minimally competent student **just** (barely) meets the curriculum expectations at level 2.
- A minimally competent student has **just** enough of the requisite knowledge and skill to achieve <u>most of the time</u> according to level 2 expectations, although their knowledge and skill may be limited.
- A minimally competent student is **borderline** level 2.
- A student who is minimally competent at level 2 has done **just enough** to be described as someone performing in/at level 2.
- Minimally competent students are deemed to be operating at/in level 2, but **only just**.
- Over a number of tasks and contexts, on average, this student will produce performances that are overall **just good enough** to mean level 1 is <u>not</u> an appropriate descriptor.

Assessment conditions

It was important for panel members to understand the circumstances under which students completed the NMSSA assessments. The operational constraints of NMSSA assessments meant that, in some ways, the demands of this assessment were not completely in line with normal classroom activities. When students are less familiar with a process, and are less supported by teachers and classroom activities, they will tend to perform at a lower level than they would if the supports were in place.

When thinking about question difficulty and how the conceptualised group of borderline students would respond to each question, the panel was reminded to consider the following points.

- Students had no teaching support for this assessment.
- There was no classroom or peer discussion to help students develop their thoughts.
- Students had no 'scaffolding' in the form of a class study module, or project.

In judging the difficulty of a question for various groups of minimally competent students, the panel was asked to think about:

- how a primary school student **thinks** and **processes information**
- the cognitive demands of the question, including:
  - how many pieces of information students needed to process
  - how many thinking steps it would take to answer correctly
- the presence of abstractions or metaphors in the question
- the depth of inference required
- whether the question has a 'reading between the lines' aspect
- whether the context is familiar and/or engaging
- the text length and text complexity
- the sophistication of vocabulary
- any common misconceptions that may trip students up
- the question type (responses that require writing are automatically more difficult).

5. Estimating response distributions

Curriculum alignment of the technology assessments required panel members to fill in a grid for each item showing their estimate of the distribution of scores that a group of minimally competent students (at the appropriate curriculum level) would get on that item. Figures A3.2a and A3.2b show an example grid before and after being filled in. The possible scores for this item were: 0, 1 or 2.

2. How do you know this?

Q2		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	2																				
	1																				
	0																				

Figure A3.2a Estimating response distribution grid example

2. How do you know this?

Q2		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	2	X	X	X																	
	1	X	X	X	X	X	X	X	X	X	X	X	X								
	0	X	X	X	X	X	X	X	X	X											

Figure A3.2b Estimating response distributions - example of grid filled in

From the grids, raw scores were calculated for each item and then averaged across all panel members. The resultant raw scores were transformed into scale scores, which represented the cut-points on the scale where curriculum level 2 and level 4 started.

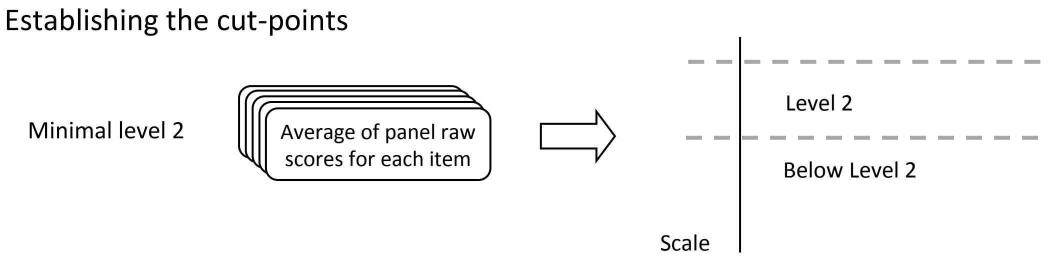

Figure A3.3 Transforming estimated response distributions to scale cut-points

The curriculum aligment procedure is a relatively high-stakes exercise for NMSSA assessments. Therefore, before collecting scores, feedback was given to panel members regarding what their judgements meant in terms of the percentage of students achieving at or above various curriculum levels.

Panel members worked in groups of four, but made individual judgements on the distribution grids. This was followed by a more general discussion and a chance to re-consider their estimated distribution of scores. There was no requirement for complete agreement between panel members. However, throughout the day, care was taken to challenge judgements that varied widely, or that appeared to be wildly inconsistent with assessment results. Justifying their thinking to each other assisted panel members in deciding whether to update their original judgements.

Level 3

Panel members were satisfied that level 3 would be appropriately placed half way between the level 2 and level 4 cut-points.

6. Post-hoc review of the technology alignment

The technology alignment proved to be somewhat challenging as one component of the technological practice strand could be assessed. The judgements in one group for the Session 1 tasks appeared to be inconsistent. While complete agreement was not a requirement, these individual judgements were re-considered and updated after lively discussions.

Some degree of group effects (differences between groups) and individual effects (one member leading the group influencing other judgements) were evident in the judgements. Therefore, changing the panel members across sessions was found to be a quite useful practice to eliminate or minimise these confounding effects.

At the end of the day, the panelists were asked to comment on the alignment process. Members indicated that they had enough information regarding the alignment exercise to make their judgements. The curriculum alignment procedure was seen to be as robust as possible by the alignment team.

7. Results

Table A3.2 shows the final locations on the TELI scale for the beginning of level 2, level 3 and level 4.

Table A3.2 Final curriculum level cut-points for Technological Literacy (TELI) assessment

	Level 2	Level 3	Level 4
TELI scale cut-points **(TELI units)**	69.8	94.4	146.0

Appendix 4:
Assessment Framework for Te Reo Māori

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1. Introduction

Ko te reo te mauri o te mana Māori • *The language is the life force of mana Māori*

Sir James Henare

Te reo Māori is an official language of Aotearoa New Zealand. The te reo Māori group-administered assessment is designed primarily to monitor students' knowledge and understanding of te reo Māori words and phrases in Year 4 and Year 8, in English-medium schools. This document locates the assessment of te reo Māori in relation to the New Zealand Curriculum (NZC), and provides an overview of the framework that guided development of the assessment.

2. Te reo Māori in the New Zealand Curriculum

Te reo Māori is included in the learning languages area of the NZC. The three inter-related strands of learning languages as they can be applied to te reo Māori are:

- communicative competence: the use of te reo Māori to engage in meaningful social interactions
- language knowledge: the accurate use of te reo Māori, from the single-word level to more complex language structures
- cultural knowledge: an awareness of cultural beliefs being expressed through te reo Māori and cultural practices.

Te reo Māori differs from other learning areas in that there is no compulsion to teach te reo Māori to a particular level of proficiency in particular years in English-medium contexts. Therefore, a student's age is not necessarily related to their knowledge of te reo Māori (arguably, a 5-year-old and a 13-year-old could be at the same point in learning te reo Māori). We hypothesised that for a large number of students, their knowledge and understanding of te reo Māori words and phrases would be at the lower end of level 1 of the learning progressions described in *Te Aho Arataki Marau mō te Ako i Te Reo Māori* (see Table A4.1).

Table A4.1 Summary of reference points in NZ curriculum statements, as applicable to the assessment of te reo Māori

The New Zealand Curriculum	**Learning languages in *The New Zealand Curriculum***	***Te Aho Arataki Marau mō te Ako i Te Reo Māori*** (selected achievement objectives)	**Te reo Māori assessment:** knowledge and understanding of words and phrases
The Vision, Principles and Values • confident • connected • actively involved • lifelong learners, etc. **The Key Competencies** • Thinking • Using language, symbols and texts • Relating to others • Participating and contributing	**Three strands:** • Communication (the core strand): use the language to make meaning • Language knowledge (one of two supporting strands): how the language works, and how it is structured and adjusted for different contexts • Cultural knowledge (the second supporting strand): the inter-relationship between culture and language	**Level 1:** • Greet, farewell, and acknowledge people and respond to greetings and acknowledgments • Communicate about number, using days of the week, months and dates • Use and respond to simple classroom language **Level 2:** • Communicate about relationships between people • Communicate about time, weather and seasons	• Recognise Māori words that are commonly used in English ('loan words') • Recognise the Māori equivalent of English words and short phrases • Recognise the English equivalent of Māori words and short phrases • Identify an appropriate response to a basic greeting/question in te reo Māori • Write single words in te reo Māori

3. What will the assessment of te reo Māori tell us?

An analysis of the student data will be used to answer the following questions about students' te reo Māori learning:

- What is the spread of Year 4 and Year 8 students' achievement in te reo Māori across curriculum levels?
- Is there progression, on average, in te reo Māori achievement from Year 4 to Year 8?
- What are the relationships between student achievement in te reo Māori and demographic characteristics (particularly student ethnicity, gender, year level; and school decile)?

More specifically, the assessment of te reo Māori has been designed to answer the following questions:

- To what extent can students:
  - identify English equivalents of te reo Māori words in common use by English speakers ('loan words' such as *haka* and *kai*), and vice versa
  - identify English equivalents of te reo Māori words (e.g., body parts, classroom objects), and vice versa
  - identify English equivalents of te reo Māori words associated with tikanga Māori (e.g., *formal speech*), and vice versa (e.g. *karanga*)
  - recognise appropriate responses to simple questions in te reo Māori
  - accurately record equivalent English words for te reo Māori words, and vice versa.

4. Making valid claims about te reo Māori assessment results

To ensure the assessment will allow us to make valid claims in relation to students' achievement in te reo Māori, as described in the NZC, a conceptual assessment framework was used to guide the design and development of the assessment items (see Table A4.2). The claims and sub-claims shown in Table 2 are based on the three sub-strands of learning languages presented in English in the NZC, as they apply to te reo Māori. These informed decisions about the number and type of items to be developed. The items included multiple-choice response and constructed response questions.

Table A4.2 Conceptual assessment framework for te reo Māori assessment

Claims from te reo Māori assessment for NMSSA		
When students learn te reo Māori, they learn:	Students will be able to:	Item types and characteristics
• to use te reo Māori to make meaning (Communication strand)	• recognise appropriate responses to simple questions in te reo Māori • accurately record equivalent English words for te reo Māori words, and vice versa.	• Selected-response items • Single-word written-response items
• how te reo Māori works (Language Knowledge strand)	• identify English equivalents of te reo Māori words in common use by English speakers ('loan words' such as *haka* and *kai*), and vice versa • identify English equivalents of te reo Māori words (e.g. body parts, classroom objects), and vice versa.	
• about the inter-relationship between culture and language (Cultural Knowledge strand).	• identify English equivalents of te reo Māori words associated with tikanga Māori (e.g. *formal speech*), and vice versa (e.g. *karanga*).	

Table A4.3 Item map for an assessment of te reo Māori

Main questions	**Related sub-questions**	**Item types**				
		Respond in Māori to Māori selected-response	English to Māori, selected-response	Māori to English, selected-response	English to Māori, short written response	Māori to English, short written response
To what extent are students developing:	**Can students:**					
• *communicative competence* in te reo Māori?	• recognise appropriate responses to simple questions in te reo Māori?	●				
	• accurately record equivalent English words for te reo Māori words, and vice versa?				●	●
• *language knowledge* associated with te reo Māori?	• identify English equivalents of te reo Māori words in common use by English speakers ('loan words' such as haka and kai), and vice versa?		●	●		
	• identify English equivalents of te reo Māori words (e.g., body parts, classroom objects), and vice versa?		●	●		
• *cultural knowledge* associated with te reo Māori?	• identify English equivalents of te reo Māori words associated with tikanga Māori (e.g. formal speech), and vice versa (e.g. karanga)?		●	●		

References

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

Ministry of Education. (2009). *Te Aho Arataki Marau mō te Ako i Te Reo Māori – Kura Auraki/Curriculum Guidelines for Teaching and Learning Te Reo Māori in English-medium Schools: Years 1-13*. Wellington: Author.

Appendix 5:
Assessment Framework for Technology

Contents:

Figures:

Tables:

1. Introduction

This appendix describes the assesment approach that the National Monitoring Study of Student Achievement (NMSSA) took to assess technology in 2016. It describes how technology is set out in the New Zealand Curriculum[6] (NZC) and outlines the conceptual framework that guided the development of the Technological Literacy (TELI) assessment used by NMSSA to assess technology.

2. Technology in the New Zealand Curriculum

In the NZC, technology is defined as:

> … intervention by design: the use of practical and intellectual resources to develop products and systems (technological outcomes) that expand human possibilities by addressing needs and realising opportunities. Adaptation and innovation are at the heart of technological practice. Quality outcomes result from thinking and practices that are informed, critical, and creative. (NZC, (p. 32)

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

The technology learning area comprises three strands:

- technological practice: knowing how to plan for practice, develop and evaluate a brief and outcome
- 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.

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.

Components of the technology strands

Each strand contributes to the construct of technological literacy and comprises two or three components. Although the NZC describes these components as interrelated within a strand, and the strands as interrelated within the learning area, one intention of the assessment of technology was to identify the relative achievement of students in each of the strands in addition to students' level of achievement in techological literacy (across the strands). The technology assessment, therefore, consisted of a number of items focused specifically on individual components within strands situated in a range of common contexts for students at Year 4 and Year 8.

Table A5.1 is an extract from the NZC and describes the achievement objectives within each strand for the technology learning area at level 2 (the level that Year 4 students are expected to be achieving at) and level 4 (the level that Year 8 students are expected to be achieving at). This provided the conceptual foundation for developing technology assessment tasks and items.

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

Table A5.1 Level 2 and level 4 achievement objectives in technology by strand and component

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

3. Assessment of technology and curriculum coverage

The Technological Literacy (TELI) assessment was a group-administered assessment that covered the three technology strands. The technology indicators of progression[7] were used to provide the component for each item and for developing the associated marking rubric.

Table A5.2 presents the curriculum coverage matrix for the TELI assessment by strand and component.

[7] http://technology.tki.org.nz/Technology-in-the-NZC/Indicators-of-progression/Learning-Progression-Diagrams

Table A5.2 Coverage matrix for the Technological Literacy assessment by strand, component, question and curriculum level of Technology Indicators of Progresson (L)

		Technological Practice			Technological Knowledge			Nature of Technology	
TASK TITLE	Score points	Planning for practice	Brief development	Outcome development & evaluation	Technological modelling	Technological products	Technological systems	Characteristics of technology	Characteristics of technological outcomes
Care Robot	5							Q1 *L2/3* Q2 *L2/3*	Q3a/b *L4*
Cell Phone Pocket Mock-Up (Y4)	4			Q2 *L1/2*	Q4 *L1/2*				
Cell Phone Pocket Mock-Up (Y8)	2				Q5 *L1/2*				
Corrector	5			Q6b *L2/3*					Q2a Q2b Q3 *L2* Q4 *L2*
Doofer	7						Q3 *L1* Q4 *L1/2*		Q2 *L1/2* Q5 *L2/3*
Fit Fabric	5				Q2 *L2/3*	Q1 *L1/2*			
Hole Punch	5				Q3 *L2/3*				Q2 *L1/3*
In The Kitchen	2					Q1 *L1/2*			
Library Sorting System	4						Q1 *L1/2/3*	Q2 a/b *L2/3*	
Mystery Object	6					Q2 *L2* Q3 *L2*			Q1 *L1* Q4 *L2/3/4*
New School Playground	2	Q1a/b *L2*							
Ogo (Y8)	6				Q2 *L4*			Q3 *L2/4*	Q1 *L3*
Pōhā	4					Q1 *L2*		Q2 *L2/3* Q3 *L3*	
Popcorn Maker	6						Q1 *L1* Q2 *L1/2/3*		Q3 *L1/2*
School Sunhat	4			Q1 *L1/2/3/4*	Q2 *L1/2/3*				
Self-Driving Cars	5							Q1 *L2* Q2 *L2* Q3 *L2* Q4 *L3*	
Toothbrush Design Y4	4	Q1 *L2*	Q3 *L3*						
Toothbrush Design Y8	4	Q1 *L2*	Q5 *L3*						
Two in One	4			Q2 *L1/2/3/4*					Q3 a/b *L1/3*
Which Bottle?	4		Q2 *L1/2/3/4*						

The TELI assessment contained a total of 17 tasks at Year 4 and 18 tasks at Year 8. Each task included a set of items based on one theme or idea. Descriptive criteria were used to mark each item. Items were scored dichotomously (0 or 1) or using scales that ranged from 0 to 2 or 0 to 3. Table A5.3 shows the breakdown of the number of tasks, items and score points for each strand in the TELI assessment. Some aspects of the technological practice strand relating to students making artefacts in authentic contexts could not be accommodated in the NMSSA programme.

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

Table A5.3 Number of tasks, items and weighting of score points in the TELI assessment, overall and by strand

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

*using score points

4. Example of two assessment tasks

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

Task: *Doofer*

In the task called *Doofer* students were shown a video clip that shows how an invention called a doofer and its special dispenser work. They were asked to follow a set of instructions to construct the doofer (Figure A5.1). The *Doofer* task contained four items (Figures A5.2–A5.5).

Curriculum Strands: Technological knowledge, Nature of technology

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

Follow the instructions on your doofer to put it together.

Figure A5.1 Illustration of the *Doofer*

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

Figure A5.2 Item 1 of the TELI task *Doofer*

Item 2. The doofer dispenser is a machine that enables the customer to get a doofer.

On the photo of the doofer dispenser label its parts.

Component: Identifies the components of a technological system and how they are connected

Scoring category	Example responses
0: Inappropriate response or unable to respond	"Magnet"
1: Identifies parts – includes the handle and suction/sticky cup	

Figure A5.3 Item 2 of the TELI task *Doofer*

Item 3. Explain how the dispenser parts work together so a customer can get a doofer

Component: Identifies the role each component has in allowing the inputs to be transformed into outputs within simple technological systems

Scoring category	Example responses
0: Inappropriate response or unable to respond	"Push" "Get a doofer"
1: General description of function	"Push the handle down and take a doofer" "Suction cup grabs doofer" "Lift handle to get a doofer"
2: Deeper description describing how all 3 actions effect the transformation	"Handle is pushed down so suction cup makes contact with one doofer and it is released from the pile; then the handle is pulled up with the doofer attached"

Figure A5.4 Item 3 of the TELI task *Doofer*

Item 4. Why might *Burger Fuel* (the burger restaurant) have a dispenser for their doofers?

Component: Describes possible users and functions of a technological outcome based on clues provided by its physical attributes

Scoring category	Example responses
0: Inappropriate response or unable to respond	"To help" "To get a doofer"
1: Simple reasoning	"To make it fun" "To keep it clean" "For easy storage" "To get one if they want it"
2: Deeper reasoning that describes need	"To have something other burger outlets don't have" "To be seen to be environmentally friendly by not giving every customer a doofer" "So people wouldn't take many – only one at a time." "To save staff costs in handling or constructing doofers"

Figure A5.5 Item 4 of the TELI task *Doofer*

Task: *School Sunhat*

In the task called *School Sunhat* students were told to imagine they have been asked to design a new sunhat for the students at their school. Their school wants the sunhat to provide protection from the sun, stay on and be comfortable to wear. The *School Sunhat* task contained two items. The first item required students to sketch and explain how the sunhat met the design brief (Figure A5.6). The second item required students to explain how using a computer might help a person when they design a sunhat (Figure A5.7).

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

Draw a sketch of a new sunhat for your school. **Item 1. On your drawing write notes to explain how the sunhat:** **a) Provides protection from the sun** **b) Stays on** **c) Is comfortable to wear**	
Component: Describe design ideas (either through drawing models and/or verbally) for potential outcomes	
Scoring category	**Example responses**
0: No explanation about needs (a-c) outlined in the brief / Explains how design meets only <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 A5.6 Item 1 of the TELI task *School Sunhat*

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

Figure A5.7 Item 2 of the TELI task *School Sunhat*

Marking rubrics for the two assessment tasks

Marking rubric for the tasks, *Doofer* and *School Sunhat* are provided in Tables A5.4 and A5.5

Table A5.4 Task 1: *Doofer*

Title:	**Doofer**	• **Level:**	4 & 8
Code:	TE 16 S003	• **Approach:**	GAT
Task Info:	**video clip, doofer**		

Col 1 Q2. What are **two** good things about the design of the doofer? Think about how it has been made. STRAND: Nature of Technology

SCORE:	0	1	2
Criteria:	Inappropriate response e.g. it holds a burger, made to hold food	General statement/Observations e.g. It's cool/fun, you can build it, easy to make, no mess, juices don't fall out Describes doofer but with no link to design e.g. It is made out of cardboard, it has instructions	Describes properties and how they related to the design choices e.g. It is made from recycled or sustainable materials/cardboard It is a net which means it can be stored flat/is easy to make up/is stable The curved shape means it fits the shape of a burger
• Characteristics of Technological Outcomes	No/Weak understanding of concept	Identify the physical and functional attributes of technological outcomes. Level 1	Identify a technological product and describe relationships between the physical and functional attributes. Level 2

Col 2 Q3. On the photo of the doofer dispenser label its parts. STRAND: Technological Knowledge

SCORE:	0	1
Criteria:	Inappropriate response e.g. magnet	Identifies parts – must include the handle **and** suction/sticky cup (plunger)
Technological Systems	No/Weak understanding of concept	Identify the components of a technological system and how they are connected. Level 1

Col 3 Q4. Explain how the dispenser parts work together, so a customer can get a doofer. STAND: Technological Knowledge

SCORE:	0	1	2
Criteria:	Inappropriate response e.g. push down or get a doofer	General description of function e.g. push the handle down and take a doofer OR suction cup grabs doofer OR lift handle to get a doofer	Deeper description describing how all 3 actions effect the transformation e.g. handle is pushed down so suction cup makes contact with one doofer and it is released from the pile, then the handle is pulled up with the doofer attached
Technological Systems	No/Weak understanding of concept	Identify the components of a technological system and how they are connected. Level 1	Identify the role each component has in allowing the inputs to be transformed into outputs within simple technological systems. Level 2

Col 4	Q5. Why might *Burger Fuel* (the burger restaurant) have a dispenser for their doofers?		STRAND: Nature of Technology
SCORE:	**0**	**1**	**2**
Criteria:	Inappropriate response e.g. to help, to get a doofer	Simple reasoning e.g. to make it fun, to keep it clean, for easy storage, hygiene, to get one if they want, it is tidy	Deeper reasoning describing need e.g. Marketing - To have a point of difference/something other burger outlets don't have (gimmick); To be seen to be environmentally friendly by not giving every customer a doofer; To save staff costs in handling/constructing doofers; So people wouldn't take many – only 1 at a time
Characteristics of Technological Outcomes	No/Weak understanding of concept	Describe the physical and/or functional attributes of a technological outcome that provide clues as to who might use it. Level 2	Describe possible users and functions of a technological outcome based on clues provided by its physical attributes. Level 3

Table A5.5 Task 2: *School Sunhat*

Title:	**School Sunhat**	• **Level:**	4 & 8
Code:	TE 16 S002	• **Approach:**	GAT
Task Info:			

Col 1

STRAND: Technological Practice

Q1. Draw a sketch of a new sunhat for your school.

Q2. On your drawing write notes to explain how the sunhat: (Must explain drawing with notes)

a) Provides protection from the sun
b) Stays on
c) Is comfortable to wear

SCORE:	0	1	2
Criteria:	No explanation about needs outlined in brief (a-c) Explains how design meets only **one** need outlined in brief Inappropriate response	Explains how design meets **two** needs outlined in brief e.g. padding for comfort, SPF fabric to protect from sun, Velcro or hat in many sizes to stay on	Explains how design meets **all three** needs outlined in brief
Outcome Development and Evaluation	No/Weak understanding of concept	Describe potential outcomes, through drawing models and/or verbally. Level 1/2	Describe design ideas (either through drawing, models and/or verbally) for potential outcomes. Level 3/4

Col 2

STRAND: Technological Knowledge

Q3. How might using a computer help a person when they design a sunhat?

SCORE:	0	1	2
Criteria:	Inappropriate response e.g. it is easier, research, it builds it, you can use an app/program, don't need to sketch	General description e.g. can change colours/size, quick to design, can see which design works best	Detailed specific description e.g. shows finished product in detail, 3D - so can see from many angles, made to scale – accurate measurements, no waste of materials, use an app to simulate sun
Technological Modelling	No/Weak understanding of concept	Identify the purpose of functional modelling. Level 1 Identify the design concept being tested in particular functional models. Level 2	Identify the benefits and limitations of functional modelling undertaken in particular examples. Level 3

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Report 15

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