2022 NCEA Assessment Report

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Subject: Technology

Level: 2

Standards: 91358, 91359, 61360, 61363

Part B: Report on standards

91358: Demonstrate understanding of how technological modelling supports risk management

Observations

There was an overall improvement in the quality of reports submitted this year.
The majority of reports tended to be the full ten pages but many candidates who attained excellence did so in around six pages. Reports that reached the page limit were occasionally repetitious, and could have been more succinct.

Some reports which were at the page limit were repetitious and gained little from the additional descriptions. It was evident that some candidates aiming for Excellence did not use the Achieve or Merit criteria as scaffolding to meeting the Excellence criteria. Candidates must support high-level discussions with explanations of how and why. Candidates frequently use common technological literacy key words in discussing their work but on occasions fail to provide explicit references or examples that provide the required evidence. For example, a candidate might have said "*as a result of the modelling the risk of something that the stakeholder would not like was reduced*". The candidate should be more specific in describing what design elements are being improved or selected and why.

Candidates who started the report by defining what functional modelling and risk are, were commonly successful attaining the higher grades but candidates should avoid overly long descriptions. Even more successful reports started with an introduction and definitions of modelling using examples of their own and others technological practice to illustrate their understanding.
It was common to see candidates identify the severity of risk in their development work but less so acknowledging the probability. Candidates should attempt to identify how likely the risk could happen.
Many reports covered research and product analysis at great length and in some cases to the detriment of the functional modelling process in reaching a conceptual outcome or prototype. In these cases, candidates had not established the specifications and criteria that they should have been using to measure their modelling against to make informed decisions (shoulds). Modelling, such as research, should be discussed in terms of establishing what is feasible for the concept and what should happen. The report should not be overly focussed on inquiry and brief development. There is an expectation that these elements have been largely established.

This year there was less reliance on third party case studies which tend not to allow candidates the opportunities that their own practice provides in accessing the higher levels of attainment.

Where reports were structured without provided questions/template, (which candidates simply answered) there was an increase in the candidate's ability to demonstrate a deeper understanding of their own technological practice. Also, candidates who had freedom to seek their own opportunities within a given context tended to be more genuine in selecting and choosing particular modelling methods and in turn were more likely to have a clear vision of what is feasible. Where a group was provided with a structured design task it tended to constrain candidate understanding of what was possible and the options they should decide on. This also leads to candidates not taking the initiative to follow opportunities that arose from one form of functional modelling to another.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- worked within a writing template that contained questions for the candidates to respond to or in some cases an overly structured writing frame
- made minor attempts to tackle the criteria for higher achievement levels such as the severity of risk but without sufficient explanations
- merely stated that something is a risk but not describing and explaining what the specific risk is or what impacts the risks would have
- attempted to address the impact, severity and probability of risk within a table format, but this limited the candidate's ability to explain how modelling identified the risks
- made vague and subjective decisions as part of modelling exercises with little consideration of wider factors (shoulds)
- focussed on the procedure followed in their practice i.e., the process of modelling was documented not the information gained through modelling and how this changed / influenced their concept
- were limited in the frequency in which they referred to different stakeholders e.g., referred to them as "stakeholders" rather than being explicit about which stakeholder.

Candidates who were awarded **Not Achieved** commonly:

- submitted an incomplete report
- used a limited range and forms of modelling
- struggled to identify and explain wider factors (shoulds) and how modelling informed decisions
- tended to have themselves serve as the primary stakeholder within their own practice and not relate the modelling evidence to any other stakeholder groups
- provided explanations around product development that tended to be arbitrary rather than based on modelling evidence
- gave little or no descriptions or explanations of specific risks.

Candidates who were awarded **Achievement with Merit** commonly:

- identified a specific end user
- were able to explicitly describe different risks and explain the impact of ignoring these risks
- tended to establish early on in the report what specific wider factors such as social, moral and environment factors they were measuring their judgements against in making 'should' decisions
- demonstrated a developed understanding of how modelling shaped their own ongoing technological process
- displayed a strong understanding of the value of modelling to inform what could and should be done
- through different functional modelling activities candidates had explored alternative feasible ways a particular functional or aesthetic element could be considered
- chose relevant and appropriate modelling methods and resources that matched particular, feasible design elements that they wanted to test.

Candidates who were awarded **Achievement with Excellence** commonly:

- were able to provide insight into why the evidence provided by modelling was valid and reliable by making links between different stages in their practice
- discussed and compared alternative ways the modelling could have been done and why the method and resources they chose were the most effective ones
- established who the end user was for their concept and sought opinions from their target audience
- frequently centred discussion around stakeholders and their credentials i.e., the reasoning as to why their opinion mattered
- discussed and compared different stakeholders and what impact their feedback had on the development of the concept
- showed evidence that they followed the advice and opinions of others.

91359: Demonstrate understanding of the role of material evaluation in product development

Observations

Candidates who showed autonomy of their choice of tests, and products tended to show higher levels of understanding. They were better able to explain their report, and their end choices. In other cases, it was evident where candidates were from the same class / school due to having tested the exact same materials in the exact same way as others. In these instances candidates commonly made tests irrelevant to individual end products, and could not clearly explain their understanding. Submissions showing identical sections to online research, also did not show clear understanding. These observations indicate that class templates are at risk of candidates providing rote-learned content rather than showing understanding.

Almost all the food technology submissions involved sweet dessert end products. The scope for true testing of materials seems to be narrower for sweet products than for savoury, as most candidates merely tested different sugars and flours. It would be good to see candidates attempting savoury end products and testing a wider range of materials, particularly those involving meat, dairy, and grain alternatives for the growing number of food allergies and special food needs in society today.

Candidates who explained and discussed relevant testing and evaluation techniques and processes achieved higher scores than those who randomly tested materials or chose tests that were not relevant to the end products.

Successful candidates were able to demonstrate the relationship between materials tested, test results and the product outcome. They used a reasoned argument to explain their decision-making around material selection after applying evaluative techniques. This process may have included:

- testing more than one feasible component, ingredient, or material, and/or testing against a produced control
- making a reasoned choice that related to the performance properties required of the end product (demonstrating fitness for purpose)
- demonstrating an understanding of sustainable practices by including the maintenance and disposal implications of their material choice
- using downloaded information sparingly and / or explaining how their use of downloaded information was incorporated into their understanding of their testing, material choices and end product's fitness for purpose
- included photos of the testing process / result as well as of the end product / prototype.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- explained the relationship between the performance specifications of the end desired product and the performance properties of the materials tested
- described the performance specifications of their desired outcome to allow for evaluation against criteria
- described relevant and safe testing and trialling techniques to evaluate the performance of a material within their product to judge its fitness for purpose and suitability in relation to the performance specifications of the end product
- included the use of knowledge relating to composition, changes in composition and structure of the material described in the use of fair tests and trials (in their own words to demonstrate understanding of online research as opposed to simple copy and paste)
- tested hypotheses regarding the suitability of a material while evaluating components / ingredients / materials for inclusion.

- made decisions or judgements about a particular material relative to the performance specifications required in the product, i.e., explained the choice to use the material in relation to the outcome and its performance specifications.
- demonstrated they understood the purpose of the types of testing and trialling they were using to make decisions.

Candidates who were awarded **Not Achieved** commonly:

- described generic knowledge relating to a group of products or general descriptions without relating this knowledge to the specific testing of materials / ingredients / components.
- used significant amounts of online information without putting it into their own words to demonstrate actual understanding.
- focussed on techniques and processes for the material and product rather than evaluating the materials used.
- demonstrated little knowledge of the actual product, material, or evaluation process
- used an initial brief with performance specifications that did not allow for the demonstration of knowledge.
- focussed on the development or trialling of an outcome without referring to the evaluation procedures used to select the materials.
- described the process of their technological practice without demonstrating understanding of material evaluation.
- focussed on testing a whole product rather than aspects of an incorporated material to be selected for use in the product.

Candidates who were awarded **Achievement with Merit** commonly:

- explained the selection of materials after a process of evaluation, testing and trialling in various forms
- explained the knowledge and techniques used in the evaluation processes
- made the decisions and rationale for selection clear
- explained why the tests they used were to determine the suitability of the materials to be used
- included the maintenance and disposal implications of using a specific material within the product
- identified different types of testing – subjective and objective.

Candidates who were awarded **Achievement with Excellence** commonly:

- continued to test and trial until product specifications were met
- discussed the relationship between the performance properties of the material, the design of the outcome and the performance specifications of the outcome
- discussed how maintenance and disposal (sustainability) impacted on their material decisions for the outcome
- took risks with their testing to step outside the comfort zone of using well-known materials / ingredients / components to test alternatives, perhaps relating to special dietary needs, meat alternatives, uncommon fabrics, etc.
- used a reasoned argument to decide the selection of materials after evaluative techniques were applied
- developed a conclusion relating to the suitability of a material in relation to the product’s design.

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91360 Demonstrate understanding of redundancy and reliability in technological systems.

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New Zealand Qualifications Authority

Observations

Candidates must ensure the initial system chosen, is advanced enough to be considered a "Technological System", and must have sufficient knowledge of what reliability and redundancy are in a technological system to be able to clear identify the key requirements of the assessment.

The reasoning about why Reliability and Redundancy was addressed / applied in the Technological System, must be clearly described and explained, including the outcome of the inclusion of both.

Candidates should be able to discuss their chosen system's reliability and redundancy features, the importance of these "R&R" decisions in both the design and maintenance phases, and have access to data on past examples of systems that design engineers used to guide any future system development.

Understand the key social, cultural and / or environmental factors which impact on a systems reliability through redundancy in design/development phases.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- selected systems that were technical enough to explain the importance of both Reliability and Redundancy but at a low level
- were able to explain how R&R was addressed within the individual subsystems of the technological system they had selected.

Candidates who were awarded **Not Achieved** commonly:

- failed to identify a technological system
- named a technological system but did not provide enough technical depth within the system to answer the assessment requirements in the required detail
- wrote long assessments that researched a particular technological system, however their assessment was based more on the specifications of the system rather than on how Reliability and Redundancy was addressed within the system, and why decisions were made regarding Reliability and Redundancy.

Candidates who were awarded **Achievement with Merit** commonly:

- selected a technological system with enough depth to not only show detail in the importance of both reliability and redundancy within the individual subsystems that made up the overall system but were also able to explain this in some depth
- had a clear understanding of why each decision was made in the development of the technological system and were able to explain this in a detailed or comprehensive manner.

Candidates who were awarded **Achievement with Excellence** commonly:

- were able to discuss in depth, their chosen systems Reliability and Redundancy features, the importance of these R&R decisions in both the design and maintenance phases
- used past examples of systems that design engineers used to guide any future system development
- were able to determine the key social, cultural and / or environmental factors which impact on a systems reliability through redundancy in design / development phases.

91363: Demonstrate understanding of sustainability in design

Observations

The sustainability in design knowledge was stronger this year with a wider range of contexts, case studies and less templated reports. There were more creative responses to sustainability in design through all aspects and subjects of technology however innovation in design was often not discussed and weak in a high percentage of the achieved reports.

The majority of successful candidates explored Life Cycle Analysis (LCA) and used the 'Sustainability Venn Diagram' to identify areas where economic, environment and societal related factors could be influenced and resolved by innovative design decisions to increase the sustainability of a product. Often candidates were able to identify alternatives that would increase the sustainability of a product, both within their own technological practice and / or in the practice of others.

Successful candidates also used the "Venn Diagram" to identify viable, bearable, equitable and sustainable considerations that impact on a designer's decision-making process, and how these impact on the life cycle of the product.

Reports would benefit from being proofread for consistency and to ensure all report writing guidelines were adhered to as there were instances of decreased font sizes and margins being extended.

A common issue was candidates stating, inaccurately, that 'the product meets the LCA', where LCA is an assessment of all the outputs and inputs into a product's life from raw materials to its disposal.

It is essential that the candidate's chosen context aligns with the Achievement Standard and enables the candidate to demonstrate an in-depth understanding of sustainability in design.

Reports that followed a template often enabled candidates to gain achieved grades, but this did however limit higher achievement. Candidates would benefit from a report structure that included innovation, competing priorities, compromises and relevance to either their practice or the practice of technologists.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- described a Life Cycle Analysis (LCA) model and the Sustainability Venn Diagram and then used these to inform their own Technological Practice and / or critique a product and the practice of others.
- described how design decisions or interventions could increase the sustainability of a product.
- described how life cycle analysis of an outcome enabled them to identify innovative practice which addressed social, economic, or environmental concerns and was able to contribute to, and enhance, product sustainability.

Candidates who were awarded **Not Achieved** commonly:

- included models of Life Cycle Analysis (LCA) , Cradle to Cradle and/or the Sustainability Venn Diagram but had no descriptors and showed limited understanding.
- described Life Cycle Analysis (LCA), but with limited evidence that informed the considerations to determine the focus for design interventions.
- provided innovation that was weak or missing from the report
- focused on fairtrade and ethics rather than sustainability in design

- produced a report that was limited to how and why materials may be produced, recycled, or reused; or limited their report to explanations about how to prolong the life of an outcome
- described the life cycle of a material such as cotton, plastic, or aluminium without incorporating 'design'
- produced a report where large sections were "cut and paste", with no student voice or discussion of own technology practice.

Candidates who were awarded **Achievement with Merit** commonly:

- explained how Lifecycle analysis (LCA) influenced innovations made by designers in case studies
- submitted evidence derived from their own Technological Practice conducted an LCA of an existing product and explained the focus for design innovation. This knowledge was often applied within their own development of a sustainable technological outcome
- explained how the competing priorities and compromises were managed within the development and lifecycle of a sustainable technological outcome but lacked detail for Excellence
- showed an in depth understanding of sustainability in design. In particular, design decisions that impacted on the sustainability of the outcome (both positive and negative)
- innovation was clearly identified, most frequently through the use of case studies and then applied to their own design thinking.

Candidates who were awarded **Achievement with Excellence** commonly:

- emphasised the competing priorities and compromises made as a result of lifecycle analysis in the development of a sustainable technological outcome. This was often evident within naturally occurring evidence where a student was required to address dilemmas and balance in different aspects of the LCA, conflicting social, environmental, and economic factors and demands within their own practice
- discussed how life cycle analysis can influence a technologist's design decisions to improve the social, economic, or environmental sustainability of an outcome
- discussed how issues identified in the lifecycle lead to design innovations
- discussed their own technological practice, and that of other technologist(s), in relation to sustainability in design
- included a high level of independent voice and reflective comments regarding their practice that justified the compromises made and illustrated and demonstrated an understanding of sustainability in design
- applied this understanding to their own design / product and provide justifications for their decisions with clear links back.