NZQA
New Zealand Qualifications Authority
Mana Tohu Matauranga O Aotearoa

Assessment Report

Level 3 Technology 2016

Standards 91612 91613 91614 91617 91632 91636 91638

Report on Standards

91612: Demonstrate understanding of how technological modelling supports technological development and implementation

Candidates who were assessed as **Achievement**
commonly:

- understood the relevance of modelling at different stages of technological practice and how modelling can be used to address competing and/or contestable factors and to inform/influence decision-making during the development and implementation of an outcome
- reflected on a variety of modelling (e.g. brainstorming, critical analysis of existing solutions, market research, concept drawings, mock-ups, toiles, prototypes) used during the development and implementation of an outcome
- identified a range of relevant competing and/or contestable factors associated with the development and implementation of an outcome. e.g. time versus quality, the use of renewable versus non-renewable resources, budget constraints versus the use of ideal materials, the use of resources of cultural significance in traditional versus contemporary contexts, innovation versus social acceptance
- explained how different forms of modelling were used to inform/influence the designer's decision-making with respect to addressing competing and/or contestable factors
- identified and explained a range of functional modelling used during the development of an outcome
- identified and explained the prototyping used during the implementation of an outcome
- described the results of the different forms of modelling and how these were used to identify and address competing and contestable factors during the development and implementation of the outcome.

Candidates who were assessed as **Not Achieved** commonly:

- described technological modelling without identifying how this modelling was used to address competing and/or contestable factors
- described technological modelling from technological practice without any mention of why the modelling was used or how the modelling enabled informed decision-making
- described technological modelling in a general manner with no reference to their own or other's practice
- identified a range of functional modelling used, yet failed to explain the purpose of the modelling or expand the description to include prototyping or the evaluation of a prototype in situ
- omitted any explanation of how factors influenced and affected the modelling, e.g. competing and contestable or similar factors
- included a range of sketches, screenshots, diagrams, and photos, yet did not explain how they related to the modelling undertaken.

Candidates who were assessed as **Achievement with Merit** commonly:

- explained in depth, the different forms of modelling used, the stages where these were applied and what evidence the modelling (functional/prototyping) provided
- demonstrated in-depth understanding of the different types of competing and contestable factors to be resolved and why different forms of modelling at different stages of the technological process can be used to help resolve these
- explained in depth how evidence provided by different types of modelling/prototyping allowed the designer to justify the decisions made during the development and implementation of the outcome.

Candidates who were assessed as **Achievement with Excellence** commonly:

- provided a comprehensive and reflective discussion, including context-specific examples, regarding how functional modelling/prototyping was used and how the functional modelling/prototyping influenced the development/implementation of an outcome
- provided a comprehensive and reflective discussion on how the designer responded to the modelling, including how the modelling enabled the designer to defend and validate their decision-making during the development and implementation of the outcome
- explained (with context specific examples) the difference between competing and contestable factors and demonstrated evidence of understanding competing and contestable factors within the wider context of economic, social, political, and environmental factors
- explained how competing and contestable factors were resolved and explained the changes that were necessary to resolve these factors.

Standard-specific comments

Generally, candidates presented their work in a suitable manner. Most schools provided candidate submissions on A4 pages within the ten-page limit. Some schools exceeded the 10-page limitation; and, in this case, only the first 10 pages of evidence of a large submission can be marked.

Some submissions were either photocopied or photographed pages from visual diaries or included poorly digitised screen captures. This resulted in the material being either pixelated, blurred, or too small to read, making the data illegible. Likewise, some submissions were presented using a smaller font size or were handwritten; these reports were more difficult to read.

Although most reports showed understanding of different forms of technological modelling, some candidates did not show understanding of how technological modelling supports technological development and implementation.

Templates provided by schools were, in general, an adaptation of the exemplars provided on the NZQA website. Where the requirements were correctly interpreted, the use of templates made it simpler for candidates to address the evidence requirements of this standard. However, restrictive templates limited the degree of detail of evidence that the candidates could provide. In some instances, there was too much direction given, including very specific questioning techniques that restricted or weakened the candidate's response, further diverting the candidate's response from the requirements of the standard. Templates that encouraged a "fill in the gap" response or provided considerable guidance generally disadvantaged the candidates.

Some work submitted by some candidates within clustered submissions showed noticeable similarities. Candidates must provide evidence that all work is generated by them as individuals. Some candidates were able to adapt the generic templates provided to show their individualized understandings – for example, providing examples from their own technological practice or examples from case study material. Where candidates were able to use their own voice when evidencing their understandings, they were more able to demonstrate a richer understanding of the different forms of modelling used and how the modelling helped the designer to address competing and/or contestable factors.

Some candidates demonstrated understanding from case study material, yet the approach they took was more in line with a summary rather an in-depth evaluation of the technological modelling undertaken and the technologist's practice. When using case study material, candidates would be best to comment on the evidence provided pertaining to the modelling undertaken rather than surmising or constructing their own interpretation of what 'might' have happened or what 'could' happen. Furthermore, an undeveloped adaptation of the case study report does not demonstrate understanding.

It is imperative that the candidates comment on the range of technological modelling undertaken and how this modelling was used to test competing and/or contestable factors in order to inform decision-making during the development and implementation of a technological outcome.

Some candidates referred to their own practice to demonstrate their understanding. Generally speaking, the evidence presented in the candidate's own practice met the requirements of the standard; however, in some instances, the candidate's reflection on their own practice lacked the depth of understanding in relation to the competing and contestable factors to be resolved. Where candidates were provided with context specific, robust, and relevant case study material, they were more able to grasp the fundamental principles underpinning the purpose of technological modelling

and how and why different forms of technological modelling are used to test and address a variety of competing and/or contestable factors.

Some case studies used for evidence were not suited to the requirement of the standard, particularly where candidates discussed the general practice of the technologist rather than identifying and demonstrating understanding of the technologist's modelling and how it was used to test competing and/or contestable factors.

Candidates were disadvantaged if a case study or their own technological practice did not provide evidence of a range of modelling used to test competing and/or contestable factors, including prototyping and the evaluation of the prototype in situ. Likewise, candidates were disadvantaged if the case study or their own technological practice did not provide evidence concerning the nature and difference between competing and/or contestable factors.

Other candidates did not meet the standard because they did not provide evidence of how the technological modelling (functional modelling and prototyping) informed decision-making during the development and implementation of the technological outcome. Some submissions identified functional modelling practices within technological practice but did not clearly link the modelling to the competing and/or contestable factors being tested or addressed. Similarly, the competing/contestable factors identified tended to be elementary or primary issues such as cost of fabric, using scrap fabric for toiles, food hygiene, colour choices rather than the more pertinent factors associated with the wider context such as economic, social, political, cultural and environmental factors (for example, environmental risks and the sustainability of materials used in practice, one-off, unique outcomes versus mass production, etc.). These factors need to be considered, and it is essential that candidates show their understanding of the difference between competing and contestable factors, the nature of competing/contestable factors, and how different forms of evidence gained from technological modelling can be used to address such factors.

In summary, those candidates who performed well in this standard demonstrated the ability to discuss in-depth, using context specific examples within their own practice or that of others, how and why a range of technological modelling was used, including how the modelling supported the designer to defend and validate their decision-making during the development and implementation of the outcome.

91613: Demonstrate understanding of material development

Candidates who were assessed as **Achievement**
commonly:

- provided a clear and concise report, including an introduction that stated clearly what material(s) and product(s) and specific enhancements were being described
- used referenced materials such as charts and diagrams from credible sources to describe the processes and concepts and development of a specific material(s)

- used relevant diagrams and visual material to describe the specific enhancement of a product in relation to the material used and used captions and titles to establish links to their commentary
- wrote a clearly structured and organised report that made clear links between the material, its development and implications on the design, development, production, maintenance, and disposal of specific product(s). This required the candidate to understand the relationship between the material, the enhancement to the product/material, and the product functionality
- described the material and or the product in relation to ongoing maintenance and disposal (dependent on the context) that addressed the criteria and did not merely focus on sustainability or recycling
- described clearly the relationship between the development of a material from a historic to contemporary application within a product and how the product has evolved or developed from the material enhancement
- described the manufacturing process of a specific material and related it to the performance of the product being discussed
- identified the properties of the material and linked this to the performance characteristics of a specific end product(s)
- integrated the properties of a material into the impact on a product
- described the enhancement of the product in terms of characteristics such as washability, tensile strength, durability, flexibility, weight in relation to enhancement of speed, general speed enhancement, viscosity, taste, flavour, texture, preservative action and extension of shelf life, nutritional value
- described the material(s) in relation to the design, development, production, ongoing maintenance, and disposal of products specified.

Candidates who were assessed as **Not Achieved**
commonly:

- submitted a report without any referencing of information, diagrams, or pictures
- wrote a generic report that did not address specific materials, enhancements or aspects of the design, development, production, ongoing maintenance and end of life disposal of specific product
- described product or material sustainability rather than how the product can be maintained or disposed of at end of life
- used an internal assessment evidence as the basis of their report without addressing the criteria of this standard
- used significant downloaded material that was un-mediated and showed limited understanding or links to product enhancement
- identified a material but did not describe the development or enhancement
- described the application of a material in practice but did not describe the enhancement in relation to the product
- described their own product and materials used and processes that did not address the issues of material properties, enhancements or maintenance, and/or the design, development, production, ongoing maintenance and end of life disposal of the product
- provided evidence of the construction and issues encountered when developing a project that the candidate had made without describing the development of the materials used, their

impact on the products performance or the implications of the material chosen in relation to a specific enhancement
- provided charts on the manufacturing process without discussion or description on the development of the material
- provided visual material and pictures that had no or little relevance to the report and were not used to explain or unpack concepts required by the standard
- described and compared the development of more than one material without providing links to a product
- described the manufacturing and development of a material without describing the enhancement of a product
- described the manufacturing process and the development of a product without clearly describing the implications on the product
- provided a list of material properties without relating it to an end product
- provided only parts of the list of elements in the criteria of design, development, implementation, maintenance, and disposal
- provided lengthy background history only of a product, e.g. swimwear or car materials used over time without reference to other aspects of the criteria.

Candidates who were assessed as **Achievement with Merit** commonly:

- used referenced material from relevant sources and material that was mediated
- used the information gathered from a range of credible sources and gave detailed examples and rationale for the relationship between material, enhancement, and product in a well-constructed report format
- demonstrated knowledge of material properties and made clear links as to how material properties enhanced the development or evolution of a product
- explained how the material impacts on the design – aesthetic and functional attributes of the product identified
- explained how the material impacts on the maintenance and life cycle of the product, and how the material disposal impacts on health and environmental factors
- provided detailed examples of how the material enhancements have led to new and innovative product development
- explained the historic application of material to contemporary application and enhancement
- provided explanation of the material properties related to the specific material development
- described the manufacturing process of the specified material and provided charts and/or diagrams to illustrate the development of the material that were referenced appropriately
- explained the implications of the material such as environmental impact, disposal, and care of the material on the end product and provided evidence and examples of this
- made links between the structure and composition of the material and the performance enhancement of the product
- provided explanation of specific components rather than a total product, e.g. bike frame compared with a bike, or airplane wings compared with an airplane, linked to the enhancement
- explained the maintenance and disposal of a material further than recycling (may have included by-products and environmental impact).

Candidates who were assessed as **Achievement with Excellence** commonly:

- used downloaded material judiciously and referenced accurately and appropriately
- synthesised the information and wrote this in their own voice in a well-structured report
- made synthesised statements and relational links between the product, material, and performance enhancement
- explained the concepts and processes used in the manufacturing and development of the material in detail and with valid evidence derived from a range of credible sources including technical data
- explained how the enhancements in material have led to development of enhanced products and explained how these products have significantly enhanced sport performance, market performance, health safety performance, speed, durability, life cycle, etc
- provided evidence when describing the material development, e.g. explained the molecular structure and the impact of the structure on the performance of a material and its enhancement of the end product
- explained and provided sufficient evidence to show how the properties of a material have been developed over time to enhance a product
- provided rational for the material properties and the enhancement of the product with justified research and diagrams
- explained the impact that the material had on the life, care, repair, and maintenance of an end product
- explained maintenance, care, and disposal of a material further than recycling and explained the impact of maintenance on the product use and reuse.

Standard-specific comments

The focus of this assessment task is on material development – often from base components such as nutrients or ingredients, base elements, fibres – and the material development's impact on the design, development, implementation, maintenance, and disposal of specific products. Candidates are required to demonstrate their understanding of the relationship between a specific material and its development, enhancements that the material brings to products and the specific product in terms of the design, development, production, ongoing maintenance, and end of life disposal of the product.

Candidates who wrote about materials relevant to their context of study could demonstrate understanding of material development. This use of authentic context for learning also supported candidates to write coherently in their own voice to demonstrate their understanding from a range of experiences and multiple sources of information.

Candidates who chose a material and product where the information was readily available and specifications of technical details were provided could explain concepts and processes more readily than those who chose contexts with limited availability of resource information.

In general, candidates who achieved could describe a specific material or materials, identified an enhancement – such as speed, strength, flexibility, nutritional value, texture wash ability, durability, viscosity, flavour – which contributed to the specific product performance, and identified this in relation to a specific context or usage. The development of a material over time in an historical

and/or contemporary context gave the opportunity for candidates to define both the development and enhancement features of both material(s) and the product(s). Candidates who were too generic in their descriptions and explanations of materials, enhancements and/or products often did not achieve.

Candidates who focused on their own practice and product development were significantly limited in their achievement because they were unable to describe or explain the development of the basic materials within specified products. If student practice is the focus, then candidates must relate the material and enhancements to the product specified.

Note that material in this case is not synonymous with the term fabric but relates to the component parts of textiles, such as man-made, synthetic, or natural fibres, their development, production, and enhancement. Comparisons of materials within a product to select materials for use is not the focus of this standard.

Candidates should ensure they are addressing the aspect of maintenance and disposal of products and materials in its widest sense and not relying on sustainability or recycling as the basis for their discussion.

Care should be taken when sourcing, referencing, and using information from a range of sources to ensure their credibility and that plagiarised material is not submitted. Candidates should use the advertorial material available judiciously because this may not support their understanding and may not be authentic. Large amounts of unmediated copied text do not support candidate achievement and should be both limited and referenced. Candidates must demonstrate understanding of information and make sense of this relative to the criteria of the standard.

Successful candidates typically demonstrated effective writing skills. They used the language of the context to synthesise their understandings, wrote their own voice and used minimal downloaded material. Candidates who provided a distinct and well-fined introduction outlining the material, the enhancement, and the product made the direction and content of their report clear. Critical thinking and the ability to synthesise information is a skill that candidates require at this level of the curriculum.

Some candidates obtained high levels of achievement within this standard by discussing feasible future products, making it clear that some aspects are yet to be tested or including materials from trials of materials in the testing and development phase and making evidence-based hypotheses about the long-term feasibility, maintenance, and disposal of the products once it is beyond the prototype stage.

It is not sufficient for candidates to take the evidence for an internal assessment such as an implement standard and merely present this for their report. Some of the material from other learning and assessments may be relevant, but it must address the criteria for this standard and be mediated in a way that demonstrates their understanding of the concepts and processes relating to material development.

91614: Demonstrate understanding of operational parameters in complex and highly complex technological systems

Candidates who were assessed as **Achievement**
commonly:

- distinguished between complex and highly complex technological systems
- provided an example of a complex system and identified the operational parameters within this system as a measurable range of values (e.g. 10°C minimum – 25°C maximum temperature in an air conditioning system)
- identified and explained one or more concepts that lead to the establishment of operational parameters (e.g. concept of optimum ambient temperature for humans)
- explained the implications that these concepts had on the design as well as the development of the system
- provided an accurate explanation of how the operational parameters allow the system to function
- provided an accurate explanation of how the operational parameters enable maintenance in the system; maintenance is clearly linked to operational parameters
- identified a highly complex system that is self-regulating and/or intelligent as well as the operational parameters associated with this highly complex system
- explained social factors that influenced the establishment of the operational parameters in a highly complex system
- explained technical factors that influenced the establishment of the operational parameters in a highly complex system.

Candidates who were assessed as **Not Achieved**
commonly:

- chose simple technological systems as opposed to complex and highly complex systems
- produced information that was technically inaccurate
- did not identify operational parameters associated with a complex system
- wrote about concepts used in the design and development of technological systems, but did not link these to operational parameters
- wrote about maintenance in a technological system but did not link these to operational parameters.

Candidates who were assessed as **Achievement with Merit**
commonly:

- explained in detail with examples of how a highly complex system operates within its parameters (e.g. air fuel ratio in fuel injection systems operates between 12:1 to 17:1)
- discussed, considering different ideas, why social and technical factors influenced the establishment of operational parameters in a highly complex system.

Candidates who were assessed as **Achievement with Excellence** commonly:

- discussed, by comparing and contrasting different ideas, of how operational parameters influenced the design, development and maintenance of systems (both complex AND highly complex systems).

Standard-specific comments

Overall, candidates demonstrated a good understanding of operational parameters in technological systems. In future candidates would benefit from structuring their reports in such a way that it corresponds with the criteria outlined on the marking schedule.

91617: Undertake a critique of a technological outcome's design

Candidates who were assessed as **Achievement** commonly:

- structured their report to reflect all the requirements of the standard
- explained the concept of good design
- explained views of design
- explained judgement criteria used to determine the quality of the design of technological outcomes
- recognised that different judgement criteria can be used to judge good design depending on time, tastes, and societal values
- explained how ideas about good design have shifted to cater to societies new demands, for example, sustainable products and social benefit
- critiqued the design of a technological outcome using recognised and appropriate design judgement criteria to a level that reflected 'appraisal'.

Candidates who were assessed as **Not Achieved** commonly:

- did not appraise a specific technological outcome but rather a generic product type
- misinterpreted "appraisal" to be broadly describing and explaining the function and/or appearance of a technological outcome rather than judging it against recognised judgement criteria, e.g. candidates wrote "how it looks and works" rather than "why it is a good design" – refer to Explanatory Note 3 for some of the criteria that could be used)
- did not include evidence that related to one or more of the assessment criteria for achievement
- chose a technological outcome that had limited scope

- chose a technological outcome that was overly complex
- chose to critique the use of design elements within an outcome rather than using recognised design judgement criteria.

Candidates who were assessed as **Achievement with Merit** commonly:

- discussed why contemporary judgement criteria are important for design decision-making and evaluated the quality of a selected technological outcome using appropriate judgement criteria
- chose to critique a technological outcome of which they had personal experience and knowledge
- proportioned evidence within the report to ensure that the critique was the crux of the report.

Candidates who were assessed as **Achievement with Excellence** commonly:

- selected judgement criteria that were appropriate to the technological outcome and the reasons for their selection was clearly articulated
- explored and discussed the impact of utilising specific criteria
- explored how design decisions were often a compromise to meet the requirements of conflicting requirements
- personalised the judgement criteria to be used which also promoted greater levels of personal voice
- justified the evaluation of a technological outcome's design
- identified areas where future enhancements to a technological outcome may be possible.

Standard-specific comments

The focus of this assessment task is the critique/appraisal of a technological outcome using recognised design judgement criteria. In order to meet the requirements of the standard candidates are also required to:

- explain the concept of good design, why criteria for judging the quality of design change
- AND explain views of design and judgement criteria used to determine the quality of the design.

Whilst meeting the requirements of these two bullet points is important, the quality of the appraisal of a technological outcome using design judgement criteria selected by the student is where the majority of Merit and Excellence level evidence is to be found. Many candidates who dedicated 8 pages explaining the first two bullet points had difficulty meeting Merit and Excellence requirements due to be brevity of the actual appraisal/critique.

Candidates need to be able to differentiate between elements, principles, specifications and design judgement criteria. These are connected; often, more than one of these is present when critiquing a design. In short, design elements may contribute to a candidate's explanation and discussion of chosen design judgement criterion but are not usually broad enough to be deemed a suitable

criterion in isolation. The same is also true of refined specifications (ie. candidates can comment on the application of design elements when judging “aesthetically pleasing”, but should not use line, contrast, alignment or dimensional measurements etc. as stand-alone criteria).

Candidates should ensure that the criteria selected are a good fit for the outcome being critiqued. Candidates who utilised predetermined and/or ‘whole class’ criteria were often disadvantaged.

The design judgement criteria should reflect the technological and societal environment that the outcome was designed to fulfil. User expectations and interpretations can vary significantly between different versions of a product. Critiquing an iphone 7 vs Motorola head-to-head by using current user expectations is not a valid critique because they were designed for similar but distinctly different purposes and capabilities.

Candidates would often discuss why and how views and criteria change design decision-making in the first segment of their report but were unable to incorporate this knowledge into the critique of different iterations of the same product by using multiple viewpoints rather than judging if the product was fit for the purpose in its time, e.g. a 15-year-old phone is not a good design because it does not have Wi-Fi connectivity or fingerprint recognition like an S7.

When a compare/contrast model is used, candidates need to ensure that the outcomes have been designed with similar purposes or that they are able to provide a balanced debate that makes allowances for shifts in societal expectations and technological innovations between technological outcomes. A compare/contrast model can assist in a discussion if the nuances of a design decision are debated. However, many candidates presented a comparative review between two products rather than discussing the virtues of design judgements in relation to their chosen criteria.

The selection of the outcome to be critiqued often impacts on student achievement. Writing a comprehensive critique of a complex technological outcome can be difficult given the page limit. Candidates who selected a simple product were often more successful than those who selected a complex outcome. Candidates are more able to identify the intricacies of a design and identify factors that may have impacted to design decisions for simple outcomes, e.g. hammer vs supercar.

An aspect that often restricted candidates from gaining Excellence was not recognising and commenting on how differing perspectives of criteria can influence perceptions of a design by different groups within their actual critique of a product.

Excellence candidates often justified their selection of certain criteria over others and why these were relevant to the product, target market, personal preferences of the candidate, or how the criteria chosen were formulated to provide an in-depth and balanced critique.

91632: Demonstrate understanding of complex concepts of information systems in an organisation

Candidates who were assessed as **Achievement**
commonly:

- wrote about an organisation with all the components of an information system
- accessed sufficient detail about the system
- provided relevant examples from within an authentic organisation
- described components of an information system and then explained the interactions between components the information system
- provided clear, consistent and accurate explanations of the difference between data, information, and knowledge with explanations related to the selected organisation
- explained more than one characteristic of good information using relevant examples from within the selected organisation
- explained end-user considerations using relevant authentic examples from within an existing organisation
- explained how security management is handled within an existing organisation.

Candidates who were assessed as **Not Achieved**
commonly:

- did not demonstrate understanding by providing actual examples.
- Reproduced material from previous exemplars
- specified hardware but did not its interactions with other components
- listed of components of the information system without relating the components to the functioning of other components.
- did not write about an information system
- wrote about a fictitious organisation
- omitted one or more of the key standard criteria within the report
- did not understand the difference between data and information.

Candidates who were assessed as **Achievement with Merit**
commonly:

- discussed how information provides value to the organisation with relevant examples
- discussed the impact of end-user considerations on components of the system
- discussed the implications of security requirements upon the information system.

Candidates who were assessed as **Achievement with Excellence**
commonly:

- evaluated a system as fit for purpose.
- showed depth of understanding by complex use of real examples.
- Understood the concept of added value and provided examples to show their understanding
- evaluated trade-offs between characteristics of good information
- justified a systems emphasis on particular performance characteristics over the others
- evaluated trade-offs between security and end-user considerations

- used the organisations information requirements and/or stakeholder needs to evaluate whether a system was fit for purpose.

Standard-specific comments

Candidates must reference or mediate sources. Where information from a source is simply reproduced, it is ignored.

Candidates who did not consider an actual information system in an actual organisation limited their achievement level.

Candidates who understood the purpose(s) of an information system in relation to the stakeholder had a basis for evaluation. Those who had no clear idea of purpose often did not convince the marker that they grasped the nature of information.

When candidates reported on a system that did not have all the components of an information system, the report did not provide sufficient evidence for the standard.

Unsuccessful reports often did not provide any detailed examples beyond what was already provided in the exemplars.

91636: Demonstrate understanding of areas of computer science

Candidates who were assessed as **Achievement**
commonly:

- exceeded the requirements of one area of computer science, however, did not meet the requirements for the other area
- had some knowledge, however were unable to show any practical investigations that they had followed to investigate the area of computer science, to clearly demonstrate their understanding
- described key problems that are addressed in selected areas of computer science
- relied only upon examples that are straight out of the CS Field Guide or textbooks. (For example, when explaining a practical example, students use only a cray fisherman example rather than something more relevant and personal to show deeper comprehension
- wrote about the problems that are associated with computer science)
- used a template to support candidates
- wrote about commonly-used computer science areas in day-to-day use
- wrote within directive templates, and were therefore not able to convey their understanding
- used templates that limit students to specific answers and may not encourage students to develop the depth required for Achievement with Merit.

Candidates who were assessed as **Not Achieved** commonly:

- did not describe the key problems in enough detail to be able to explain the techniques used
- Did not explain the key technique
- did not select the areas of Computer Science listed in the standard
- only submitting one area of computer science
- copied examples directly from the internet or the Field Guides without showing any mediation to show understanding (e.g. craypots)
- gave in-depth commentary on the social impact or future in a world of AI without describing the key problems, or explaining examples of practical application of the techniques or algorithms
- wrote verbosely, e.g. talked to chat bots with no structure or purpose, or talked about programming languages with no basis, or moving images without having an explanation to follow
- made incorrect interpretations about data
- used a predetermined set of questions with which they used to try to catch the artificial intelligence chatbot out.

Candidates who were assessed as **Achievement with Merit** commonly:

- had done a practical activity and discussed and explained it, e.g. write about the advantages and disadvantages of the computer science area
- provided student voice based on the activities, examples or investigations
- provided explanations were reasoned and accurate.

Candidates who were assessed as **Achievement with Excellence** commonly:

- showed original practical examples of computer science areas
- showed comprehensive understanding of TWO computer science areas
- evaluated the effectiveness of the algorithm and/or technique
- wrote about the problems, practical activities, future ideas, developments within an Area of Computer Science
- linked to real examples, e.g. software companies' experiences, rather than information about the companies
- integrated the techniques or algorithms into a practical example and explain with examples why they were used and the benefits or disadvantages.
- For example:
    - Agile vs. Waterfall for an actual example or case study, or
    - How an intractable problem can be mitigated, or
    - How line algorithms or matrices can improve performance.

Standard-specific comments

Candidates who wrote a report that was not at a Level 3 standard could not achieve. A Level 3 Achievement Standard asks candidates to explain key techniques. Listing or describing is not explaining.

Students are required to write a report that covers at least two areas of computer science that will be selected from: formal languages, network communication protocols, complexity and tractability, intelligent systems, software engineering, or graphics and visual computing.

These two topics together are assessed to produce a final judgement. Candidates are advised to ensure that both areas selected are completed.

Submissions where one area is of a very high standard, and the other is not, struggle to demonstrate understanding of AREAS in computer science, whether that understanding is at an in-depth or comprehensive level.

If candidates wish to achieve with Excellence, they must submit a report that covers the criteria for demonstrating comprehensive understanding of areas of computer science in BOTH topics.

Candidates who worked within an authentic digital technologies program using appropriate contexts and who were exposed to an actual development process were better able to demonstrate and explain the concepts. Those who did not rely upon a formula derived from a template were much more likely to Achieve at the highest level.

Candidates who were on the margin between grades can be affected by templates. For example, candidates who submitted a report that sat on the margin between Merit and Excellence were often affected by poorly developed or executed responses developed through an overly templated approach.

In 2016, large numbers of outcomes were marginal for Excellence. A determining factor was whether candidates had shown a complete independent grasp and had not relied on templates.

Although schools are encouraged to select areas of interest and possibly expertise, it should be remembered that there are others areas of computer science that may better interest students.

Artificial Intelligence dominated as a topic in 2016. A weakness in this topic representation was the poorly developed descriptions of the practical applications of AI. This compromised achievement. Described does not mean ‘mention offhand in one sentence’ Similarly, providing three pages of rambling chatbot transcripts does not demonstrate understanding. It demonstrates that the student liked to chat with the chatbot.

Candidates did well keeping to the ten pages of the report. Candidates who wrote concisely and targeted relevant concepts succeeded.

Candidates were advantaged when they:

- reported both an explanation of and an attempt to perform the Turing test
- reported on the protocols rather than the infrastructure when discussing Network Protocols
- produced evidence relating to computer graphics that went beyond games.
- considered more than one algorithm in relation to computer vision
- explained more than a simple regular expression when considering formal languages

- considered more than one algorithm in relation to Complexity and Tractability.

91638: Demonstrate understanding of complex concepts used in the design and construction of electronic environments

Candidates who were assessed as **Achievement**
commonly:

- referred to practical work which they had personally undertaken and demonstrated their understanding in terms of their own practical experiences
- supported their submission with annotated program code, photos, and circuit diagrams of their own original work
- covered all the required areas: software and hardware and microcontrollers.

Candidates who were assessed as **Not Achieved**
commonly:

- produced projects that had a narrow scope of concepts or had concepts at too low a level for level 3
- reproduced sometimes quite complex information about devices that did not demonstrate that the candidate understood the material that was being presented
- reproduced unannotated program code, photos and diagrams from unacknowledged sources
- did not present material that was clearly in the context of their own technological experiences
- presented information which they could not show that they had actually used.

Candidates who were assessed as **Achievement with Merit**
commonly:

- demonstrated a practical familiarity with the concepts they were talking about
- wrote about concepts that were of a level of complexity that was consistent with a course of instruction at Level 8 of the Technology Curriculum.

Candidates who were assessed as **Achievement with Excellence**
commonly:

- wrote fluently and knowledgeably from their own practical experience
- demonstrated a thorough operational understanding of the concepts outlined in the Achievement Standard

- presented the interdependent nature of the concepts involved, relating one aspect to another rather than presenting each concept
- provided descriptive details of how they had overcome problems in developing their solutions. These descriptions lent a significant level of authenticity to the candidates work because it is not possible to generate these sorts of narratives unless one has lived through a problem
- submitted a report related to a project that naturally provided many opportunities to demonstrate a significant breadth and depth of understanding at the level expected by the standard.

Standard-specific comments

Candidates who submitted less than 10 pages were not disadvantaged. Reports on grade boundaries were not improved by being longer. Often, the reverse was true, with candidates presenting material they did not understand in an attempt to fill up the report. This frequently worked against the candidate.

Candidates should restrict their report to what they actually understand. Vandidates who clearly demonstrated understanding complex concepts used in the design and construction of electronic environments wrote in their own voice, providing evidence from their own work and technological experience to support any referenced material.

Candidates who simply reproduced images and tables of data from sources such as Internet sites and teacher notes often did not demonstrate their own understanding.

Reports that reproduced supplied or sourced material without relating the identified knowledge to a specific context often did not demonstrate understanding.

The use of annotated program code, photos, and diagrams helped students demonstrate their understanding. Program code, photos, and diagrams presented as evidence without specific annotation often did not contribute to demonstration of student understanding.

Candidates should be taking or obtaining their own images to ensure that it is their own work.

Students do not need to present non-technical aspects of their projects; they should limit their report to the design and construction aspects of electronic environments. Extra information about the project reduces their ability to meet the standard because of the 10-page limit.

Program code needs explicit explanation to demonstrate conceptual understanding. Many students presented program printouts with descriptive comments; these seldom provided evidence of conceptual understanding. Students need to provide descriptions of program code at more than line-by-line level as often (at the level of work seen in this standard) are complex concepts found in one of program code. Code should be broken into segments and then the activity of the program code described for Achievement, explained for Achievement with Merit, and justified or comparisons made for Achievement with Excellence.

Many students provided technical data about LCD and semiconductor construction; generally, this did not demonstrate evidence of their understanding. However, when students presented their understandings about the use of such devices within the electronic environment demonstration of conceptual understanding was evident.

Technology subject page