National Certificate of Educational Achievement

2014 Assessment Report

Technology Level 3

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

91613 Demonstrate understanding of material development

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

91617 Undertake a critique of a technological outcome's design

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

91636 Demonstrate understanding of areas of computer science

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

STANDARD REPORTS

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

COMMENTARY

Generally, candidates presented their work in accordance with the guidelines in the Assessment Specifications for this standard.

Most candidates provided submissions on A4 pages within the specified page limit. Candidates who submitted less than that number of pages were not disadvantaged and where material was included in an attempt to fill up the report this frequently worked against the candidate.

Some reports included poorly digitised screen captures; this resulted in the material being either pixelated, blurred or too small to read, making the text illegible. Likewise, some submissions were presented using a smaller font size or were hand written, these reports were often very difficult to read. All of these presentation flaws had an impact on candidate grades when it was not possible to understand what the candidate had presented.

While 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 often structured to match the presentation format in specific candidate exemplars provided on the NZQA website. Where the templates correctly interpreted the assessment criteria, their use made it simpler for candidates to address the evidence requirements of this standard. However, many restrictive templates limited the degree of detail of evidence that the candidates could provide. In some instances the templates used provided too much direction, including very specific questioning techniques that restricted or weakened the candidate's response. This further diverted the candidate's response from the requirements of the standard. In essence, templates that encouraged a "fill in the gap" response or provided considerable guidance generally disadvantaged the candidates. Work submitted by some candidates within clustered submissions, showed noticeable similarities. Evidence from a candidate must show their individual understanding. Some candidates were able to adapt the generic templates provided to show their individualised understandings, for example, providing examples from their own technological practice or examples from case study material provided. When 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.

In some instances, candidates demonstrated understanding from case study material yet the approach they took was more in line with a summary of the technological practice rather an in-depth evaluation of the technological modelling undertaken. 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. An undeveloped adaptation of the case study report does not demonstrate understanding.

It is important that the candidate's 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.

Many candidates submitted reports focused on their own practice to demonstrate their understanding. Generally speaking, the evidence presented in the candidate's own practice was able to meet the requirements of the standard. However, in some instances, the candidate's reflection on their own practice lacked the required depth of understanding, particularly 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. These candidates clearly understood how and why different forms of technological modelling were used to test and address a variety of competing and/or contestable factors.

Some evidence presented relating to case studies was not suited to the requirement of the standard. This occurred 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 their own technological practice, or case study material used, 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 as they did not provide evidence of how the technological modelling reported on informed decision making during the development and implementation of the technological outcome. There were some submissions that 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. In weaker reports the competing/contestable factors identified tended to be elementary or primary issues such as cost of fabric, using scrap fabric for toiles, food hygiene, and colour choices. Stronger reports identified and discussed pertinent risk factors associated with a wider context, such as, economic, social, political, cultural and environmental factors.

It is essential that candidates show their understanding of the difference between competing and contestable factors and demonstrate their understanding of how different forms of evidence gained from technological modelling were used to address such factors. Those candidates who performed well in this standard demonstrated the ability to discuss in-depth, using context specific examples within their own practice and/or that of others. They were able to show how and why a range of technological modelling was used, including how the modelling supported the validation of decision making during the development and implementation of the outcome.

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:

- differentiated between functional modelling and prototyping in relation to the process of developing a technological outcome
- explained some relevant competing and contestable factors involved in the creation and/or use of the outcome that were being tested by the modelling
- showed an understanding of the relevance of modelling at different stages of technological practice
- explained how modelling can be used to address the competing and/or contestable factors identified
- explained how the modelling identified has informed or influenced decision making during the development and implementation of an outcome.

NOT ACHIEVED

Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- described the technological practice undertaken in a step by step manner without specific reference to the functional modelling and prototyping components
- failed to explain how the range of modelling identified had meaningfully informed decision making
- described some modelling practices used but didn't link it to relevant competing or contestable factors
- included material such as sketches, screenshots, diagrams and photos but did not explain how it specifically related to the modelling undertaken
- described technological modelling without identifying how this modelling was used to address competing and/or contestable factors relating to a specific outcome
- described technological modelling in a general manner with no reference to their own or other's specific practice
- identified a range of functional modelling used yet failed to expand the description to **include prototyping or the evaluation of a prototype in situ.**

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:

- explained in-depth, the different forms of modelling used as a development progressed and the nature and relevance of the evidence that the modelling provided
- explanation included detail on how specific competing and contestable factors were addressed by the modelling (although may not have distinguished clearly between the two)
- explained changes made in the planned development of an outcome because of the functional modelling undertaken
- reflected on what was or could be changed in the development because of prototyping
- made explicit links between decisions made during the development and the results of the modelling practices carried out.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- provided a comprehensive and reflective discussion showing how technological modelling can be used to defend and validate decisions made during a specific technological development
- included specific detail on how both functional modelling and prototyping influenced the development of an outcome and gave valid reasons for specific decisions made
- an analysis of how key factors were resolved through evidence gained from modelling processes showed clear understanding of the difference between competing and contestable factors.

91613 Demonstrate understanding of material development

COMMENTARY

The focus of this assessment task is on material development, often from base components for example such things 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 within the frame of the design, development, production, ongoing maintenance and end of life disposal of the product.

Candidates who were writing about materials relevant to their context of study were able to demonstrate effective understanding of material development as this was embedded in a wider teaching and learning programme that supported the development of their understanding of the relationship between materials, enhancements, product performance and the design, development, production, ongoing maintenance and end of life disposal of the product.

Candidates who were supported by access to detailed technical information and a range of sources to research contemporary or historical materials and their development were able to describe and explain the development of these materials. It is important to select materials and products for candidate where there is sufficient information for candidates to source in order to support their report writing and hence their achievement. Candidates who chose a material and product where the information was readily available and specifications of technical details were used were able to explain concepts and processes more readily than those who chose contexts with limited availability of resource information.

In general candidates who achieved were able to describe a specific material or materials, identified an enhancement, such as speed, strength, flexibility, nutritional value, texture washability, 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).

This standard requires candidates to demonstrate their understanding of a material in relation to a product / products and for the higher grades of merit and excellence to synthesise this relationship into their report covering all the aspects of the criteria from the standard. The published assessment schedule will give guidance as to this relationship between the material; its historical, technical, manipulation, transformation and formulation features; the specific enhancement such as durability, conductivity, texture, strength; and the design, development, production, ongoing maintenance and end of life disposal of the product.

It is not necessary to compare and contrast features in this standard as the criteria require the candidates to describe and explain the relationship between the above aspects, that is, the relationship between the material, its development, the enhancements and the design, development, production, ongoing maintenance and end of life disposal of the product.

Candidates who focused on their own practice and product development were significantly limited in their achievement as they were unable to describe or explain the development of the basic materials within specified products. If candidate 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.

Care should be taken when candidates are sourcing, referencing and using information from a range of sources to ensure their credibility and that plagiarised material is not submitted. Large amounts of unmediated 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

Structuring a report is a competency that should be embedded in the teaching and learning programme to allow candidates to demonstrate their understanding effectively. Candidates who demonstrated effective writing skills and used a clearly structured report using the language of the context were able to synthesize their understandings and generally wrote in their own voice with minimal downloaded material. Critical thinking and the ability to synthesize information is a skill that candidates require at this level of the curriculum in order to achieve within this standard.

Use of the Indicators of Progression and the teacher guidance material in the Technology support documentation related to Technological products:
http://technology.tki.org.nz/Technology-in-the-NZC/What-is-technology-in-the-NZC/Technological-knowledge/Technological-products
http://technology.tki.org.nz/Technology-in-the-NZC/What-does-learning-in-technology-look-like/Indicators-of-Progression/Achievement-Objectives/Technological-Knowledge/Level-Eight
and the Level 8 Teaching and Learning Guide
http://seniorsecondary.tki.org.nz/Technology/Achievement-and-learning-objectives/Level-8/TK-8-2
will support teachers to develop teaching and learning programmes that will support candidates to achieve at this level.

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:

- provided a report that was clear and concise, including an introduction that stated clearly what material(s) and product(s) were being described
- utilised referenced charts and diagrams from credible sources to describe the manufacturing processes and development of a specific material(s).
- provided relevant diagrams and visual material to describe the enhancement of a product
- wrote an organised report that made clear links between the material, its development and implications on the design, development, production, maintenance and disposal of specific products. This required the candidate to understand the relationship between material, enhancement and product
- described the material and or the product in relation to on-going maintenance and disposal, dependent on the context
- 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
- described the enhancement of the product as a result of material development,
- Identified the properties of the material and linked this to a specific end product/s performance characteristics
- integrated the properties of a material into the impact on a product
- embedded knowledge was linked to practice and or class case studies / guest speakers and/or industry visits
- 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, on-going maintenance and disposal of products specified.

NOT ACHIEVED

Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- provided 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, on-going maintenance and end of life disposal of specific product
- used significant downloaded material that was un-mediated and showed limited understanding or links to product enhancement
- used information not retrieved from credible sources
- identified a material but did not describe the development or enhancement
- described the application of a material in practice however did not describe the enhancement in relation to the product

- described their own product and materials used and processes which did not address the issues of material properties, enhancements or maintenance and or the design, development, production, on-going maintenance and end of life disposal of the product
- provided a lengthy historical perspective with little or no relevance to the material or the enhancement of a product
- Included excessive amounts of information that did not relate to the enhancement of a specified 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
- used a template chart to describe the desired properties of a product/s without identifying a material.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:

- used referenced material, sources were relevant, material was mediated and examples given
- 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
- links were made to a wide range of technological experiences; the candidates own experience, class study, field trips and external material and information
- 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
- Integrated and explained the material properties during the report explaining the material development
- provided detailed examples and reasons of how when explaining the impact of a materials properties on a product
- 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.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- used downloaded material judiciously and referenced accurately
- 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 processes/ development of the material in detail and with valid evidence derived from a range of credible sources including technical data
- explained how these developments had enhanced a product and/or lead to development of new and innovative products
- explained how the enhancements in material have led to development of enhanced products and explained how these products have significantly enhance sport performance, market performance, health safety performance, speed, durability, life cycle
- provided evidence when describing the material development e.g. explained the molecular structure and the impact of the structure on the performance of a materials and its enhancement of the end product
- explained the inclusion of a material in the development of a product to enhance performance of that product and/or consumer use
- provided descriptions and explanations of the implications of the material with relevance to the end product and the impact it had on the performance in a wider context, discussing the impact on the environment relating to maintenance and disposal
- 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.

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

COMMENTARY

Candidates overall showed significant understanding of what operational parameters are in a technological system and related these accurately to the particular complex or highly complex system they were describing.

While candidates described systems and operational parameters within them, these were often described and not explained in sufficient depth to meet the criteria for achieved in many cases.

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:

- described at least one ‘complex’ technological system (one that changes inputs to outputs via more than one transformational process)
- were able to clearly identify operational parameters in the chosen system and correctly identified parameters as specific measurable technical features or characteristics with predetermined limits. Such as: a minimum input of 120,000 lux, a sound level of at least 93 dB, a movement of no more than 12 degrees, a fuel ratio of 12:1 min and 16:1 max
- referred to the parameters of at least one ‘highly complex’ technological system (a complex system that is self-regulating and/or intelligent)
- explained by providing clear and accurate evidence how these parameters enabled the operation of the system
- explained by providing clear and accurate evidence how these parameters enabled the maintenance of the system
- explained the technical factors/concepts that were used to establish these operational parameters for the chosen complex system
- explained the social factors/concepts that were used to establish the operational parameters of the chosen complex system
- explained the implications of these concepts on the establishment of parameters when designing the complex technological system referring to specific consequences
- explained the implications of these concepts on the establishment of parameters when developing the complex technological system referring to specific consequences.

NOT ACHIEVED

Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- used simple systems, not complex or highly complex systems
- lacked understanding of what operational parameters were
- described parameters rather than explaining them; by using non-specific terms or non-technical terms

- did not refer to how factors and concepts were used to establish the parameters during the design and development of the system
- did not refer to parameters when explaining maintenance of the system
- referred to a non-technological system (operational, managerial, biological)
- referred to factors that were only technical and did not refer to social factors.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:

- described at least one 'highly complex' technological system (a complex system that is self-regulating and/or intelligent)
- explained the technical factors that were used to establish the operational parameters of this highly complex system
- explained the social factors that were used to establish the operational parameters of this highly complex system.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- referred to at least one complex system AND at least one highly complex system (two systems at least are required)
- discussed (debated, deliberated, weighed up, considered thoughtfully, compared, contrasted) the impacts of operational parameters on design and development and maintenance of the above systems.

91617 Undertake a critique of a technological outcome's design

COMMENTARY

Candidates whose report was greater than 14 pages only had the first 14 pages marked and therefore may have not achieved if further evidence was on the extra pages.

Please note that the 2015 specifications have reduced the page limit to 10 pages.

An historical account, a time line or how a technological outcome was made is not required if it does not relate to the assessment criteria, the greater emphasis of this report is on critiquing a technological outcomes design. The design should relate to its physical and functional properties and how it functions for users. Many candidates choose to critique a specific cell phone, often evaluating in-depth on its function but then neglects the physical properties. Teachers need to ensure candidates understand that the critique is about using criteria that allows the candidate to appraise the quality of the design in its fullest sense.

Candidates who are allowed to select their own chosen technological outcome to critique often have first-hand experience of using the outcome and are able to argue convincingly why it is a good or bad design. Where schools dictate the technological outcome to be critiqued it is harder to see candidate voice as they rely on manufactures information and previously written information.

This standard does not require multiple technological outcomes to be critiqued, one outcome is sufficient. Candidates who use more than one outcome to critique often only compare and contrast and do not write in-depth to create a curriculum level 8 report. However, some candidates have managed this very well by ensuring they critique using appropriate judgement criteria and making a clear argument or judgement.

Describing a collection or a designer does not allow the candidate to meet the assessment criteria.

Candidates who critique their own technological outcome often just report on their own practice rather than critiquing the outcomes design against a set of criteria. The critique often lacks depth and makes it difficult to be objective.

Many candidates wrote a comprehensive critique and explained the concept of good design but then neglected the other assessment criteria. Candidates need to explain why criteria for judging what is good design changes and explain views of design and judgement criteria used to judge the quality of technological outcomes design. Candidates need to show they are understand why judgement criteria changes by explaining it in terms of fashion, time, societal expectations/changes, cultures, gender etc. Candidates need to give good explanations using clear examples to be awarded an achieved. This is an important aspect of explaining “what is good design”, as a concept it is very subjective. Many candidates explain views of design by quoting different designers thoughts on what is good design or give their opinion on what good design is as a comparison. It is important that they explain **why** different designers/people use different judgement criteria to appraise a technological outcomes design to gain an achieved. Explaining different historical eras/movements, cultures, ages and genders, concept of good design is a good beginning. Explaining how different contexts will also have their own set of judgement criteria for example a building versus a mode of transport.

For merit candidates are asked to develop this into discussing why contemporary judgement criteria are important for design decision making. Candidates need to elaborate and present ideas that relate to today’s environment and thinking about what is good design. For excellence candidates need to discuss the impact of judgement criteria on design decision making. At level eight of the curriculum candidates are asked to consider competing and contestable factors when developing an outcome, candidates could elaborate further on this concept and relate it to the contemporary judgement criteria and ask themselves what would happen if the technologists ignored these criteria as a starting point.

Candidates who were directed to use good headings, based on the assessment criteria, to guide their reports often ensured they provided all the evidence to achieve. In a few cases candidates using this strategy were incorrectly lead by questions/headings to answer that did not correctly interpret the assessment criteria. For example, explaining why criteria for judging the quality of design changes was interpreted as how has the cell phone changed leading the candidate to give a historical account of the cell phone and not relate it to design judgement criteria changing as time progresses.

This year other subject areas selected to use this achievement standard in their assessment programme. Teachers unfamiliar with the technology curriculum learning objectives need to seek advice from the technology department to ensure they understand what a technological outcome consists of. The curriculum defines a technological outcome as:

"… products and systems developed through **technological** practice for a specific purpose. A **technological outcome** is evaluated in terms of its fitness for purpose. **Technological outcomes** can be described by their physical and functional nature." **technology**.tki.org.nz

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:

- explained all of the following:
- concept of good design
- why criteria for judging the quality of design changes
- different views of design and judgement criteria used to determine the quality of the design
- plus critiqued the design of a technological outcome using selected design judgement criteria
- explained clearly the concept of good design and gave a personal viewpoint with good examples
- explained good design in both aesthetic and functional terms using examples from different contexts to illustrate their personal point of view
- gave good reasons why people from different periods of time or from different contexts used different judgement criteria, compared to others, to judge the quality of good design
- explained that perspectives on good design are subjective depending on different peoples perspective
- used quotes from designers to demonstrate different view points on what is good design and explained them using own "voice"
- included clear views of design from the perspective of a designer and/or people such as their parents and then explained why each of these people have a different view point
- articulated how different judgement criteria is 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, eco-friendly and sustainable products
- appraised, estimated the design quality of a chosen technological outcome in accordance with a set of appropriate judgement criteria based on both aesthetic and functional elements
- listed Dieter Ram's ten principles of design and then explained these in their own words relating the explanation to their own technological outcome.

NOT ACHIEVED

Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- critiqued a technological outcome and ignored all other assessment criteria
- explained what is good design and critiqued a chosen technological outcome without explaining why criteria for judging the quality of design changes and did not explain views of design and the judgement criteria used to judge it

- described a technological outcome, often using the manufactures specifications without estimating its design quality using appropriate design judgement criteria
- wrote about the historical development of a technological outcome believing this provided evidence to why criteria for judging the quality of design changes
- did not appraise a specific technological outcome but rather a generic product. (Cellphones or buildings are generic and not a specific outcome)
- compared and contrasted two or more technological items and did not use design criteria to appraise an outcome
- explained how they made their own technological outcome – the practical steps involved but did not appraise the item using design judgement criteria
- explained the first two assessment criteria adequately then failed to critique a technological outcome at a NCEA level 3 standard by just describing the outcome and not using judgement criteria to evaluate the design
- submitted large amounts of copied and pasted material with minimal explanations in own "voice"
- provided information that confused the technological outcomes features, specifications and/or how it worked with the expected design judgement criteria
- used quotes of a designer without attempting to explaining it in the context of the report
- used a font size that was below 12pt.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded 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 design criteria
- discussed by elaborating on why contemporary judgement criteria are important for making design decisions in today's environment/society. This typically included giving examples and linking of ideas
- articulated how ideas on what makes good design today are linked with current concerns, for example the environment, user friendliness, socially beneficial, ethically sourced materials, emotional resonance, sustainability etc.
- evaluated, made a personal judgement, by analysing the quality of a technological outcomes design using selected design criteria
- chose a technological outcome they had personal experience and knowledge of to critique making it easier to make a judgement and analysis of
- evaluated the quality of a technological outcome in accordance with clearly defined judgement criteria, they typically showed reasoning behind evaluation statements.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- discussed the impact that judgement criteria have on making design decisions and justified the evaluation of a technological outcomes design
- gave detailed examples on how contemporary judgement criteria made an impact on how a technologists made design decisions in the conceptual and prototyping stages of developing an outcome

- appraised a specific technological outcome and ensured the criteria used was clearly stated and robust enough to give a detailed report with in-depth explanations
- used strong evidence, either from a personal experience or research, that was backed with a personal voice to write a critique that convincingly argued and reasoned why the chosen technological outcome was good or bad design.

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

COMMENTARY

Candidates who submitted less than 14 pages were not disadvantaged. Reports on grade boundaries were not improved by being longer. Generally, 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.

Candidates must make sure to reference any sources for material in their report.

It is important that candidates focus on an information system within an organisation and how the components of the information system interact to provide value to the organisation.

Additionally it is crucial for the candidate to have a in-depth understanding of the goals of the organisation they are discussing and the relevant interactions that need to occur to achieve these goals. Without this understanding it is difficult for the candidate to clearly demonstrate understanding of the information system within the organisation and how the information system can add value by improving efficiency of tasks, increase accuracy of information or enhance the main goals of the organisation.

Candidates who excelled in this standard were able to discuss the organisation with confidence, backing up their discussion points with clearly articulated examples.

The selection of the organisation is key to producing a report that meets the standard. When candidates used individuals or organisations that did not have all the requisite components of an information system or enough complexity to address all the required elements of the standard in sufficient detail or depth, the report did not provide evidence for Achievement of the standard

The candidate's report should go beyond describing network shares and back-up procedures for shared data. Frequently, candidates provided detailed descriptions of the hardware and/or software within an information system without explaining the interaction between the components within an information system or explaining how those components added value to the organisation.

Some candidates struggled with discussing the differences between data, information and knowledge. Often these were defined independently of each other and the examples given did not relate to the organisation they were discussing.

Of major concern is the number of candidates who continue to use the Cleveland college case study as a template for writing their report. This limited the scope of the candidates' report and made it extremely difficult for them to be able to demonstrate understanding to

the marker. The Candidates; reports based solely upon the Cleveland college case study lacked sufficient detail and/or resembled the published exemplars too closely to demonstrate the candidate's own understanding of complex concepts of information systems in an organisation.

Candidates' reports that focused upon their own school as the organisation often relied too heavily upon the Cleveland college exemplar and thus did not provide any detailed examples beyond what was already provided in the exemplars. Frequently, candidates merely substitute their own school name for that of Cleveland College and therefore it was difficult for the candidate to provide evidence that demonstrated their own understanding. This was particularly evident when discussing the differences between data, information and knowledge with candidates often using the truancy example outlined in the exemplar. Candidates who used other school related activities like NCEA examinations, candidate literacy or numeracy or sports participation were able to successfully demonstrate understanding of these concepts.

Candidates' reports that focused upon a case study organisation outside the school setting or provided detailed examples of their own school's information system beyond those provided in the exemplar were most often able to demonstrate the understanding required for achievement of the standard.

Submissions in which there were significant similarities between candidate reports raised doubts about the demonstration of individual understanding.

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:

- selected an organisation with all the components of an information system and one in which the candidate have sufficient access to detailed knowledge of the system
- explained the key standard criteria using relevant examples from within an organisation
- explained the interactions between the components of an information system instead of only providing unrelated descriptions / lists of the components
- provided clear, consistent and accurate descriptions of the difference between data, information and knowledge with explanations relating to the selected organisation
- explained more than one characteristic of good information using relevant examples from within the selected organisation
- explained more than one end-user consideration using relevant examples of the importance of the considerations within the selected organisation
- explained how security management is handled within the selected organisation.

NOT ACHIEVED

Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- highlighted the key standard criteria from the standard without providing any relevant examples to demonstrate understanding of the points covered and how these criteria to the organisation they were discussing
- relied too heavily upon the published exemplars and did not include additional details beyond what was already provided in the exemplar report

- described detailed hardware specifications but did not explain how the hardware interacted with other components of the information system
- described and/or provided lists of components of the information system without an explanation of how the components interacted within the information system
- were unable to clearly differentiate between data, information and knowledge and used the terms interchangeably within their report
- focused upon an individual or an organisation that did not have an information system, and utilised only stand-alone components or a personal computer system
- omitted one or more of the key standard criteria within the report.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:

- discussed how information provides value to the organisation beyond unprocessed raw data with relevant examples from within the organisation
- discussed the impact of end-user considerations (for example ergonomic considerations or financial implications) and how these considerations influenced the selection of the information system components; for example the choice of hardware components, network, infrastructure, required software features and/or training requirements
- discussed the implications of security requirements upon the information system, for example the choice of a Virtual Private Network, password procedures or cloud storage for backup of data.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- provided comprehensive knowledge of the organisation being discussed and it's information system by providing detailed examples for the points made in the report.
- compared and contrasted information systems for more than one organisation
- discussed how the information system adds value to the organisation with relevant, specific examples; often with reference to improvements the current information system provided over previous systems for managing the information within the organisation. The examples discussed often revisited the definitions of ‘good’ information and how this definitions could be a factor in the information system adding value
- evaluated more than one trade-off between characteristics of good information, providing relevant, detailed examples of why the organisation selected one characteristic over the other based upon the organisation's information requirements and/or end-user requirements
- evaluated more than one trade-off between security and end-user considerations, providing relevant, detailed examples of why the organisation was required to make a trade-off based on the organisation's security requirements and end-user considerations.

91636 Demonstrate understanding of areas of computer science

COMMENTARY

To succeed reports must address the criteria from the Standard.

Computer Graphics:
Not enough comprehensive understanding was shown, candidates often went straight into the practical activities of this task, rather than talking about the issues.
Network Control Protocols:
The standard is around Computer Science and protocols rather than infrastructure.
Complexity and Tractability
Candidates need to be showing their own problems and provide a comparison of the algorithms at work.
Artificial Intelligence:
Many candidates went straight into a test without providing sufficient details on why AI is a Computer Science problem. Actually interpreting the conversations and understanding a Turing test is essential for this standard.
Software Engineering:
Candidates provided details on their own projects rather than demonstrating understanding of the algorithms and techniques.
Some candidates did not seem to have the criteria of the standards in mind.
Describing a key problem:
Some candidates used teacher-provided templates (in the form of a series of questions), which didn't always lead them to cover all the criteria of the standard. Teacher prompts should trigger discussion, but it was not unusual to candidates to treat it like a test, and simply provide exam-style answers to each question, rather than using them as a starting point for their report.

Candidates that described their own software developed project rather than looking at the processes that have been developed and comparing them. They have often shown a software development process but have not named it, or explained why is suited that particular project.

Teachers need to ensure that candidates who include their own practice do not focus solely on software testing (white and black box testing), but instead focus on the wider software engineering.
Network communication:
The focus has been on the different transmission medias, rather than the algorithms or reasons. If doing Turing Tests, make sure appropriate and relevant conversation is being held. In the artificial intelligence section simply providing a printout of chatbots conversation history without explaining the computer science process behind it limited chances of success. Teachers should to encourage good questioning techniques for the chatterbots, good questions were more likely to provide material that allows candidates to show an understanding.

Although candidates provided examples of work that they created, this standard is about understanding complex computer science topics. Understanding the key algorithms and their use, rather than showcasing programming skills.

Candidates who clearly demonstrated understanding of basic concepts from computer science wrote in their own voice, providing evidence from their own work and experience to support any referenced material, class visits or guest speakers.

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

Schools that rely on highly templated structures can severely compromise candidate outcomes, as it is very difficult to determine candidate understanding when there are very similar reports being returned where candidates are parroting rather than demonstrating understanding.

Reports that reproduce supplied or independently sourced material without relating the identified knowledge to a specific context do not demonstrate understanding. The use of annotated photographic and diagrammatic evidence developed to demonstrate their understandings assisted candidates to achieve.

Some reports followed the exemplars or the CS Field and Wikipedia too closely with just minimal changes of the data. This practice did not contribute to an Achieved grade.

Candidates who produced well-formatted documents particularly well formatted code and screen shots were advantaged as this assisted the markers to establish candidate understanding.

There are six areas to choose from in the standard, and the phrase “selected areas” means that at least two of them need to be selected. Candidates that selected just one area were unable to achieve the standard. Candidates who completed one thorough report and 1 brief report did not show understanding in 'areas' of computer science and compromised their outcomes.

Some candidates chose topics in Computer Science that were not in the listed areas. Some candidates reported on topics only from a user point of view and not from a computer science perspective. Examples of this were providing detailed information on their brief development, explaining infrastructure fundamentals or coding methodologies rather than Computer Science.

Although candidates described and explained well, they were not able to discuss what practical areas the topic would be used practically in. Reports that were all text, no screen shots, and/or little to no images of what the candidate carried out made it difficult to show understanding.

Copying large amounts of material from other sources, even with a citation, doesn't show candidate understanding.

Many reports failed to identify and describe adequately the ‘key problems’ of computer science for the selected area. This is a concern as it is one of the key components of the assessment.

Candidates needed to be explicit in their explanation. Key terminology needs to be obvious to highlight understanding. For example if discussing the topic of Software engineering having clear descriptions of the different methodologies like agile, waterfall and scrum is essential. It then needs to be described in a manner that shows the candidates understanding. Either case studies or practical in class activities can do this. For

intractability and complexity candidates explain the terminology and the problem that it raises. Then attempt to show a personalised understanding of what it means. Examples chosen should clearly link to a practical use. If discussing Artificial Intelligence candidates explaining the problem with AI, and then candidates clearly explain the Turing Test, its relevance, and different outcomes explicitly mentioning Chatterbots and show a clear understanding of the techniques used by the chatterbots to appear intelligent. Simply having a short conversation with one is not acceptable. Candidates are advised to be selective in the topics they choose to report on. Candidates and teachers need to look at the achievement objectives and select topics that will best allow candidates to succeed. Choosing Artificial Intelligence provides the candidate with ample opportunity to discuss techniques and algorithms. Formal Languages and Complexity and INTRACTABILITY (not complexability) allow candidates to in some cases more easily link to practical outcomes. Software Engineering has many practical applications, and can often be supplemented by speakers or case studies.

In computer graphics:
Candidates and teachers need to have clarity in the topics covered. Teachers and candidates may find themselves pushing out past the constraints of the topic.

Candidates were disadvantaged where evidence for the standard was presented in a report longer than the specified 14 pages.

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They commonly:

- used specific terminology relevant to the field they were discussing
- used specific examples of computer science
- used images or drawings to show understanding
- discussed at least two areas of computer science
- used relevant example to highlight the points discussed
- could identify problems in the field of computer science they investigated
- described practical applications where the algorithms or techniques could be used
- used template based assessment style formats.

NOT ACHIEVED

Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- copied and pasted material and showed little understanding of that material
- misunderstood the field of computer science they investigated
- discussed one example of computer science only
- described the application, but did not link it to an actual problem
- failed to give practical examples of the application of the computer science problem
- confused the field of computer science with another area e.g. programming or hardware.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:

- demonstrated a clear and logical understanding of the problem in that area of computer science, and why it was a problem
- integrated references appropriately into their responses or in a bibliography
- drew from a number of examples in supporting their answers and illustrating the problems and possible solutions
- produced reasoning that was logical and clearly expressed
- commented on how effective the different solutions were to addressing the problems raised and understanding the compromises that arise.

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded Achievement with Excellence commonly:

- showed an in-depth understanding of the field they investigated
- used appropriate terminology when talking about specific areas in computer science e.g. Agile or waterfall methodologies
- discussed how the practical applications were linked to the algorithms used
- reduced the algorithms or techniques down and showed understanding of why they behaved the way they did
- showed understanding of what the problems were, and why they were problems
- used good example to illustrate understanding.

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

COMMENTARY

Candidates who submitted less than 14 pages were not disadvantaged. Reports on grade boundaries were not improved by being longer. Generally, 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. Those candidates 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 information 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 photographic and diagrammatic evidence developed to demonstrate their understandings assisted candidates to achieve. Photographs and diagrams presented as evidence without specific annotation often did not demonstrate understanding.

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

ACHIEVEMENT

Candidates who were awarded Achievement for this standard demonstrated the required skills and knowledge. They 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 photos, program code or circuit diagrams of their own original work
- covered all the required areas: software and hardware and microcontrollers.

NOT ACHIEVED

Candidates who were assessed as Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- reproduced a lot of sometimes quite complex information about devices that did not demonstrate that the candidate actually understood the material that was being presented
- reproduced 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.

ACHIEVEMENT WITH MERIT

In addition to the skills and knowledge required for the award of Achievement, candidates who were awarded Achievement with Merit commonly:

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

ACHIEVEMENT WITH EXCELLENCE

In addition to the skills and knowledge required for the award of Achievement with Merit, candidates who were awarded 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
- 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 almost impossible to generate these sorts of narratives unless one has actually lived through the problem
- submitted 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.