National Certificate of Educational Achievement

2013 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 a suitable manner. Most candidates provided submissions on A4 pages within the 14-page limit. Some schools still used A3 paper – it should be noted that A3 paper should still be within the 14 x A4 paper limitations. Only the first 14 pages of evidence of a large submission can be marked. A3 provides no advantages to candidates.

Candidates who submitted less than 14 pages were not disadvantaged. Reports on grade boundaries were often not improved by using 14 pages. 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.

There were some submissions saved to CD; however, the majority of submissions were computer generated using the correct font size (12) and style as per the assessment specifications for this standard. Nonetheless, there were some submissions that were either photocopied or photographed pages from visual diaries. 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 more 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, 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. In essence, 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. 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, 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. 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.

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. 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 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 as 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. 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, colour choices. Stronger reports identified and discussed pertinent risk factors associated with a wider context, such as, economic, social, political, cultural and environmental factors. For example, environmental risks, the sustainability of materials, one off unique outcomes versus mass production etc.).

These factors need to be considered.

It is essential that candidates show their understanding of the difference between competing and contestable factors. It is essential that candidates 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 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.

ACHIEVEMENT

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

- showed an understanding of 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, mockups, toiles, prototypes) used during the development and implementation of an outcome
- identified a range of relevant competing and/or contestable factors (for example, 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) associated with the development and implementation of an outcome
- 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.

NOT ACHIEVED

Candidates who were awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They 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 (for example, competing and contestable or similar factors) influenced and affected the modelling
- included a range of sketches, screenshots, diagrams and photos yet did not explain how they related to the modelling undertaken.

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, 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.

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, including context specific examples, with reference to 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.

91613 Demonstrate understanding of material development

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.

The focus of this standard is material development and its impact on the design, development, implementation, maintenance and disposal of products.

Candidates who achieved were able to describe a specific material or specific materials, identify the enhancement that contributed to the specific product performance and identified this in relation to a specific context or usage.

Candidates who considered development of a material over time had the opportunity to define the development and enhancement features of both materials and products.

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 and product performance.

Candidates 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 where there is sufficient information for candidates to be able to develop a report.

This standard requires candidates to understand and demonstrate their knowledge 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 report must focus upon the relationship between the material; its historical, technical, manipulation, transformation and formulation features, AND, a specific enhancement such as durability, conductivity, texture, strength, AND, the design, development, production, ongoing maintenance and end of life disposal of the product.

A Material must be specified and its development must be evident- considering such things as historical and or technical aspects; manipulation, transformation, formulation of the material.

The enhancement must be identified in relation to a specified product for example wash-ability, durability, strength, speed enhancement, viscosity.

Successful reports described a material in relation to design, development, production, maintenance, and 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

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

Candidates must take care when they are sourcing, referencing and using information from a range of sources to ensure their credibility.

Candidates must ensure that that plagiarised material is not submitted.

Large amounts of unmediated text do not support candidate achievement.

Structuring a report is a necessary skill that should be embedded in the course to allow candidates to demonstrate their understanding effectively. Candidates who demonstrated effective writing skills were able to synthesise their understandings and generally wrote in their own voice with minimal downloaded material. Critical thinking and the ability to synthesise information is a skill that candidates require at this level of the curriculum in order to achieve within this standard.

ACHIEVEMENT

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

- described the manufacturing process of a specific material and related it to the performance of the product being discussed
- 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
- provided sufficient knowledge of the properties of the material and clearly linked it to a specific product's performance characteristics
- integrated the properties of a material into the impact on a product
- provided a report that was clear and concise
- provided an introduction that stated clearly what material(s) and product(s) were being described
- described the enhancement of the product in terms of characteristics such as wash-ability, 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
- wrote an organised report
- made clear links between the material, its development and implications on the design, development, production, maintenance and disposal of specific products
- understood the relationship between material, enhancement and product.

NOT ACHIEVED

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

- 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
- 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
- downloaded material that was not mediated into their own voice and had little relationship to actual products
- wrote about unrelated aspects of the selected material, product chosen and performance characteristics and enhancements
- used information not retrieved from credible sources.

ACHIEVEMENT WITH MERIT

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

- provided evidence of the material properties during the explanation of 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
- clearly 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
- followed a report format that allowed the candidate to demonstrate their understanding of the performance criteria clearly and concisely
- used 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.

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:

- explained the concepts and processes used in the manufacturing process/ development of the material in detail and with valid evidence derived from a range of credible sources
- provided evidence on a macro and micro level 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
- provided descriptions 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
- linked the material development with the end product in a concise manner without providing irrelevant material and data
- discussed the impact that the material had on the life, care, repair and maintenance of an end product
- made synthesised statements and relational links between the product, material and performance enhancement
- synthesised the information and wrote this in their own style and words in a well-structured report.

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

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.

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)
- explained the technical factors that were used to establish the operational parameters of this complex system
- explained the social factors that were used to establish the operational parameters of this complex system
- 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 concepts that were used to establish the operational parameters of the complex technological system e.g. safety, intuitiveness
- 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
- correctly identified operational parameters as specific measurable technical features or characteristics within technological systems e.g. an input of 120,000 lux, a sound level of at least 93dB, a movement of 12 degrees.

NOT ACHIEVED

Candidates who were awarded 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 and not complex or highly complex systems
- referred to a non-technological system (operational, managerial, natural)
- lacked understanding of what operational parameters were
- referred to parameters in general, 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 explain maintenance of the system
- referred to factors that were only one of technical or social but not both.

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 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.

Some candidates were disadvantaged by ignoring the page count and using unsuitable fonts.

Candidates were disadvantaged by:

- using given templates as they curtailed expressing their own opinions based on a personal understanding of critiquing a technological outcome
- reporting on the history of the development of a technological outcome, as a way of explaining why criteria for judging the quality of design changes
- reporting on how use of the outcome rather than appraising its design. For example, reporting on how a digital game is played rather than an appraisal on the digital game using a set of criteria that relates to the digital world
- not stating a clear technological outcome that was to be critiqued
- critiquing more than one technological outcome
- listing the technological outcomes features rather than giving a personal report on the quality of the design against the chosen design criteria
- reporting on the specifications rather than design criteria. Often these critiques became a description heavily based on research with no or little "student voice" offering personal understanding
- critiquing a designer rather than a technological outcome.

Candidates were advantaged by:

- Selecting clear headings based on the assessment criteria, such as:
  - What is good design
  - Why judgement criteria changes
  - Different views of design and judgement criteria
  - Appraisal of named technological outcome
- selecting criteria that suited the chosen technological outcome to be critiqued
- appraising a technological outcome that was familiar to them allowing them to appraise the quality of the outcome through personal experience and expectations
- recognising that explaining views of design and judgement criteria was about explain why different individuals, groups or collectives may have different perspectives on what is good design
- recognising that design judgement criteria has an effect on design decision making at many levels as designers have to consider aspects such as: end users values, tastes, views, enjoyment, manufacturing processes, environmental concerns, form versus function etc.

ACHIEVEMENT

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

- explained the concept of good design using their own philosophical viewpoints and personal understanding and also referencing the thoughts of known designers
- referenced Dieter Rams 10 principals of good design and gave a personal explanation of the principals often relating them to a specified product or products
- gave explanations, using valid examples, of why criteria for judging the quality of design change. Reasons were related to different designer's perspectives, historical and technological advancements, changes to aesthetic tastes/fashion trends, or different cultural views
- explained different views of design by using quotes of known designers, (more than one) and summarising to show personal opinions and understanding
- critiqued a chosen technological outcome by appraising the design quality against a personally selected set of design criteria that is appropriate to the chosen technological product
- appraised the design of a technological outcome using design judgement criteria based on those of existing designers or ones that had been established and explained previously in the report.

NOT ACHIEVED

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

- appraised the design of a technological outcome, however, neglected all the other criteria required: e.g. concept of good design, why criteria to judge good design changes and views of design and judgement criteria
- used generic examples of design criteria, without providing an explanation
- did not specify a clear technological outcome to critique
- appraised the design of a variety of outcomes without establishing a clear set of judgement criteria
- described how the outcome worked or looked like with no reference to design criteria

- described the history of a technological outcome and did not address the criteria bullet points of the standard
- confused “how” with “why” when explaining why design criteria changes
- downloaded information with no referencing and no personal “voice” to explain the information in context to the standard
- used templates that encouraged a description rather than a personal viewpoint in expanding upon what is good design and appraising a technological outcome. Using templates that did not allow candidates to report on all of the expected criteria
- tried to appraise more than one technological outcome, resulting often in a description of the outcomes rather than applying design criteria to critique whether the outcome is a good or bad design.

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 by linking ideas, elaborating and applying their understanding to why contemporary judgement criteria are important for design decision making
- gave a range of detailed examples and clearly established the meaning of contemporary judgement criteria and why they are important for design decision making. Examples, (such as sustainability, eco-friendly, green manufacturing, safety, social benefit) were relevant and explanations showed sufficient depth
- reflected on environmental and ethical concerns and how these influenced design decisions
- evaluated the quality of a technological outcome using clearly defined judgement criteria. They made statements that rated the degree to which the outcome met the criteria based on valid reasoning. Their examples provided sufficient depth and clarity
- evaluated by making personal judgements/opinions based on analysing the quality of a technological outcome using clearly defined judgement criteria
- used examples of good and bad design within their explanation and appraisal of an outcome.

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 of judgement criteria on design decisions, (such as relating it to the outcome, environment, designer, manufacture, customer/user etc.)
- articulated a full and comprehensive critique of their chosen technological outcome
- chose an outcome that would allow sufficient research and exploration to meet all the criteria to meet achievement with excellence
- justified their evaluation of a technological outcome by giving valid reasons and good examples
- supported justifications with details and solid argument.

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.

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

The 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 organisation.

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 required elements of the standard in sufficient detail or depth, the report did not provide evidence for Achievement of the standard. Successful reports focussed upon an organisation for which the candidate had adequate depth of knowledge about the information system and how that information system added value to the organisation.

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 focussed 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 substituted 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.

Candidates' reports that focussed 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 had sufficient access to detailed knowledge of the system
- explained the key standard criteria using relevant examples from within a specific 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 awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- relied too heavily upon the published exemplars and did include additional details beyond what was already provided in the exemplar report
- provided descriptions or definitions of key standard criteria without explaining the relationship to an organisation
- 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 the 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
- focussed 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 and how these considerations influenced the selection of 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 information system within an organisation including several detailed examples for points made in the report
- compared and contrasted information systems for more than one organisation
- discussed how the information system provides 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
- 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 considerations
- 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 upon the organisation's security requirements and end-user considerations.

91636 Demonstrate understanding of areas of computer science

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

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.

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 such as a digital device 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.

In considering human computer interfaces, some candidates confused functionality of devices with usability. Some candidates did not refer to the usability heuristics.

Some reports followed the exemplar 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 clearly 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. A few candidates only selected one area.

Reporting upon more than two areas often produced confusion. The better reports to focused on just two areas.

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. For example, in computer science, graphics, is about how programs generate graphics (e.g. transforms, rendering), and not how to use programs that generate graphics. In formal languages, the computer science view is how to process a programming language (e.g. regular expressions and grammars), and not how to use a programming language. Similarly, visual computing, is about making sense of images through a camera or other sensor, for example, QR codes are relevant if considered in the light of vision algorithms, but error correction for QR codes is coding.

Some candidates described and explained well, but, were not able to discuss what practical areas the topic would be used practically in. This was particularly true of reports that were all text, with no screen shots of what the student had done. This made it more difficult to for the candidate to demonstrate understanding.

Copying large amounts of material from other sources, even with a citation, does not show student understanding.

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 example if discussing 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.
>
> For example 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 Chatterboxes etc.

Candidates are advised to be selective in the topics they choose to report on. Candidates and need to look at the achievement objectives and select topics that will best allow them to succeed.

For example, choosing Artificial Intelligence provides the student with ample opportunity to discuss techniques and algorithms. Formal Languages and Complexity and INTRACTABILITY (not just complexity) allow candidates to in some cases more easily link to practical outcomes.

Candidates need to have clarity in the topics covered. Candidates may find themselves pushing out past the topic. For example, if discussing network protocols, it is easy to stray

into discussing hardware and network topology, data centres and network grids. For example, if discussing Intelligent Systems or Artificial Intelligence it is easy to stray into discussing remotely controlled devices or complex programming rather than AI.

The term "problem" in the standard was sometimes taken in the negative sense. Some candidates suggested problems like "the program might crash". A "problem" in computer science (and mathematics) is just something that needs to be solved, such as finding the shortest route, sorting numbers into order and so on.

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 awarded Not Achieved for this standard lacked some or all of the skills and knowledge required for the award of Achievement. They commonly:

- copy 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:

- 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.

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:

- 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
- clearly linked the problem raised to a practical application, and were able to show how well it resolved that problem.

OTHER COMMENTS

Some candidates did not seem to have the criteria of the standards in mind. Describing a key problem was often overlooked with candidates often just discussed the algorithms or techniques.

Some candidates used provided templates, often in the form of a series of detailed questions. Sometimes the templates did not lead candidates to report upon all the criteria of the standard. Some candidates' reports resembled test papers with responses to closed questions.

Some candidates simply described their own software project rather than looking at the processes used and comparing them. Some candidates who did describe a software development process did not name it, or explain why was suited to that particular project.

Teachers need to ensure that candidates who include their own practice do not focus on software testing (white and black box testing), but instead focus on software engineering. Network communication, focus was on the different transmission media, rather than the algorithms or reasons.

If doing Turing Tests, make sure appropriate and relevant conversations are 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.

Good questions for chatbots were more likely to provide material that allowed candidates to demonstrate understanding.

Candidates did well with this standard where they set out to show understanding complex computer science topics rather than show-casing programming skills.

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.

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

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 awarded 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.