National Certificate of Educational Achievement

2014 Assessment Report

Technology Level 2

91358 Demonstrate understanding of how technological modelling supports risk management

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

91360 Demonstrate understanding of redundancy and reliability in technological systems

91363 Demonstrate understanding of sustainability in design

91367 Demonstrate understanding of advanced concepts relating to managing shared information within information systems

91371 Demonstrate understanding of advanced concepts from computer science

STANDARD REPORTS

91358 Demonstrate understanding of how technological modelling supports risk management

COMMENTARY

Candidates presented their work in a suitable manner. Most submissions were computer generated – however the font size did vary from font 11 to 20.

Some of the chart presentation, limited the degree of detail of evidence that the candidates could provide with headings given restricted the candidate's response and diverted candidate response from the requirements of the standard.

Generally candidates used case studies well by with supportive literacy prompts such as "What happened", "My opinion" or "What I think". This provided candidate submissions with their own individual "candidate voice" that showed they were able to process information to demonstrate understanding required for this standard.

A large proportion of submissions started with a general approach to define what is technological modelling and its role in supporting risk management. This was usually supported with subsequent evidence presented within a specific context such as the candidate's own technological practice or references to a specific case study. Those who did not were unable to demonstrate understanding of technological modelling and how it is used to support risk management.

Some candidates made reference to case studies and related this to their own practice to demonstrate their understanding. In some submissions it was the evidence presented in the candidate's own practice that met the requirements of the standard rather than the evidence presented from a case study of a technologist's practice. Some submissions were comparing and contrasting their own practice with technologist's case studies. This did not help candidates demonstrate understanding relevant to requirements of the standard. Candidates were disadvantaged if a case study or their own technological practice did not mention the input and impact of stakeholder's feedback related to technological modelling to support risk management.

There were a lot of submissions that identified facets of technological practice as technological modelling. These included planning; brief development and specification; stakeholders; thinking and talking; focus group;materials, safety codes, food and nutrition guidelines, workshop safety, risk registers, HACCP and other risk management charts. While there may be forms of technological modelling associated with these they should not be identified as forms of technological modelling. Candidates who demonstrated understanding at Merit or Excellence may have had some of these incorrectly identified as technological modelling but it was other evidence that met the requirements for these higher levels of achievement.

There were some submissions that identified risks that were not clearly or correctly linked to the relevant form/s of technological modelling carried out to manage these risks. Examples of these risks tended to be physical risks such as safety in the workshop, safety risks in toy making or weight bearing risks.

ACHIEVEMENT

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

- described different types of technological modelling (e.g. brainstorm ideas, mindmaps, sketches, current market product research, concept drawings, working drawings, test pieces, mockups, toiles, prototypes)
- identified types of risks (for example, resources such as expertise, time, money, correct equipment; safety concerns; design concerns; environmental concerns, stakeholder needs; material suitability; and ensuring fitness for purpose) within identified forms technological modelling
- identified at least one stakeholder group other than the candidate (for example, parents, friends, classmates, teachers, experts, focus groups, designers, engineers, manufacturers) involved with their or other's practice
- explained stakeholder consultation and feedback linked to different forms of modelling and risk management
- described forms of technological modelling in relation to what 'should' and 'could' be done to ensure the proposed outcome is fit for purpose.

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 technological modelling without identifying how this modelling would support risk management
- identified risks but with no link to any forms of technological modelling
- described technological modelling and risk management without any mention of stakeholder groups other than the candidate
- described in a generic manner how technological modelling supports risk management but not within a specific context e.g. their own practice or a case study
- described case studies that did not convey "individual candidate voice" to demonstrate understanding.
- identified risks which are not relevant to the form of modelling that was described.
- did not clearly identify who their stakeholder was or their role in technological modelling.

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 specific examples of the type of risk within different forms of modelling related to their own practice or case study
- explained severity and probability of risk that is supported by each type of modelling
- explained why different forms of modelling at the different stages required reflection on what "should" or "could" be done to ensure fitness for purpose for the success of the outcome
- explained how evidence provided by different types of modelling with consultation and feedback from stakeholders other than the technologist (or the candidate) supported risk management.

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 discussion of how different forms of modelling are used to provide communication between technologist/candidate and a range of stakeholder groups at different stages of technological practice to provide valid and reliable evidence to support risk management
- provided context specific examples throughout their report that analysed the differences in modelling used and why it was used with different stakeholder groups
- demonstrated a reflective approach to their risk management by discussing the interaction between stakeholder groups and technological modelling within technological practice to provide an effective outcome.

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

COMMENTARY

Most candidates presented submissions on A4 pages within the 14 page limit. A few schools used A3 paper and as photocopies of their folio work from their internals. A number of ther schools who used A3 paper did go over the 14 x A4 paper. Only the first 14 pages of evidence can be marked and as a consequence large submissions provide no advantages to candidates.

Candidates who submitted less than 14 pages were not disadvantaged.

There was a big improvement this year on the quality of the reports submitted. Student voice was more evident and references included were cited accurately.

More genuine evidence of testing was evident in the reports and applied to the material choices for their outcome.

Candidates who included work from their own practice and a case study failed to link the two which meant that discussions were not developed adequately.

Successful candidates often produced reports with clearly headed sections, e.g.:
Relationship between performance properties and performance specifications
Material evaluation procedures undertaken
Knowledge/Techniques underpinning a procedure

Candidates who used these types of headings and then directly and accurately reported to the requirements of the standard succeeded at all levels of the standard.

Candidates who used the template in the exemplars appeared to struggle to understand what it was that they were answering.

ACHIEVEMENT

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

- researched materials and explained the performance properties and related these to the specifications required for their product
- performed tests on a range of materials that could be used and identified the results
- described how the information gained allowed them to determine the suitability of the material for their outcome
- described the results of their testing in their report in a table format
- described in their own words evaluation procedures and how they would use the information gained to inform the choice of materials used.

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 case studies that had no material evaluation procedures to determine the suitability of the product
- included a summary of the year's work with no evidence of material evaluation procedures
- described in depth a recipe with quality control procedures, however did not look at a range of ingredients or tests to determine the best ingredient for their outcome
- explained the performance properties of the materials to be used but did not complete any testing or evaluation techniques
- carried outa range of tests on materials but did not use this information to inform their practice in creating a quality outcome
- carried out testing of materials after the outcome had been made, using the material that the teacher had provided for all the students to use.

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 the performance properties of the outcome, explained why different material evaluation procedures were undertaken and how this impacted on the choice of materials that were used for their outcome
- explained how they developed their knowledge of the suitability of materials for their outcomes
- Indicated maintenance and disposal concerns of their outcome but did not develop these in depth
- indicated why the evaluations procedures performed on a material were relevant to the performance specification of their brief
- Used the information gathered from their stakeholders to inform their material/ingredient selection.

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:

- developed their explanations to discussions by relating their findings to other possible outcomes
- discussed the relationship between performance properties and performance specifications throughout their report as well as discussing the maintenance and disposal in relation to their outcome
- created a report that discussed their experiences from their practical work and not from a case study, which enabled a genuine report with student voice to be written
- demonstrated a full understanding of what they have learnt about the material and why they chose to use what they did and how this could be used for future products.

91360 Demonstrate understanding of redundancy and reliability in technological systems

COMMENTARY

Candidates were required to demonstrate their understandings of redundancy and reliability in technological systems. Candidates chose from a wide range of appropriate systems. Those that included diagrams or images used them to support their own explanations and discussions.

Candidates who based their reports upon existing, rather than their own, electronic systems generally did better because the candidate's own practice seldom included the redundancy aspects of systems required to meet the standard.

Candidates who purposefully chose systems where there was sufficient information on the design and maintenance aspects of technological systems did well. When choosing systems to write about in the report candidates need to make sure that they have access to all the information they need.The design and maintenance aspects were not satisfactorily covered by many students; those who did presented information on aspects such as: automatic detection and indication of errors, systems that can automatically correct errors, extra reliability or redundancy to avoid human input and features of the systems that assisted maintenance personnel.

ACHIEVEMENT

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

- selecting an appropriate technological system or systems to report on
- described the application of reliability to a specific technological system
- described the application of redundancy to a specific technological system
- had a clear understanding of reliability as consistency of function
- had a clear understanding of redundancy as duplication of function
- provided clear evidence using relevant technical detail
- described the social, cultural and or environmental importance of reliability and redundancy
- provided references for their work.

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:

- had only a partial understanding of what a system is
- had an imprecise understanding of a technological system; sometimes candidates reported on organisational systems such as people making backup copies of data
- misunderstood the meaning of redundancy
- described general aspects of redundancy and/or reliability without linking it to a specific technological system.
- reproduced technical detail without linking it to redundancy or reliability.

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 why decisions regarding redundancy were made in the development of a specific technological system
- explained why decisions regarding reliability were made in the development of a specific technological system
- made the links explicit in the development stages of a specific technological system to redundancy and reliability.

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 why decisions regarding reliability were made in the development of a specific technological system
- explained why decisions regarding redundancy were made in the development of a specific technological system
- made explicit links in the development stages of a specific technological system to aspects of redundancy and reliability.

91363 Demonstrate understanding of sustainability in design

COMMENTARY

Gains in overall achievement were most evident at the higher levels. At the other end of the spectrum, a large number of candidates submitted evidence that did not adequately align with the requirements of the standard. Two aspects have been identified is restricting achievement for a considerable number of students. These being:

- Achievement was often related to which definition of sustainability was utilised by students. Explanatory Note 3 states that “Sustainability refers to the responsible management of resources to support the capacity to endure within environmental, social, and economic dimensions”. An increasing number of students are using alternative definitions for sustainability, which resulted in evidence that did not align with the requirements and intent of the Standard.

- In addition, within Explanatory Note 3 ‘resources’ were often narrowly interpreted as materials by students and resulted in a number of submissions that focused on the production of materials or reuse/recycling materials rather than addressing how the management of all available resources can impact on sustainability within an innovative Technological Product (environmental, social and economic).

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

As this new Standard is evolving and becoming more clearly understood a growing number of high achieving students are incorporating lifecycle considerations that are not explicitly stated within Explanatory Note 5. In particular, the appropriate selection of techniques, construction and joining methods, that allow for future maintenance and adaption of a product.

Some candidates were able to increase the sustainability of their designs by reflecting on the social, economic and environment factors when focusing on the aesthetic qualities of their own Technological Outcomes. This was commonly characterised by increasing the useable life of a product by design decisions that were less likely to be impacted by future trends and/or exploring possible alternative and future uses of the product. These candidates were able to produce evidence that depicted the economic, social and environmental factors that influenced design decisions and the compromises that were made within Technological Practice.

Candidates who after their initial LCA, concentrated on particular aspects of the Lifecycle that they could influence through their design choices and decisions were more likely to gain higher grades.

ACHIEVEMENT

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

- accessed both the Life Cycle Analysis (LCA) and the Sustainability Venn Diagram and used these to inform their own Technological Practice and/or critique a product and the practice of others
- explained how design decisions or interventions could increase the sustainability of a product
- explained how life cycle analysis of an outcome enabled them to identify innovative practice which addressed social, economic or environmental concerns and was able to contributed to, and enhance, product sustainability
- explained the general nature of social, economic and environmental aspects that related to the sustainability of technological outcomes.

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:

- did not make adequate reference to Life Cycle Analysis or the three pillars of sustainability
- produced a report that was limited to how and why materials may be produced, recycled or reused; or limited their report to explanations about how to prolong the life of an outcome
- focused on environmental sustainability rather than how a range of resources were managed to design and produce sustainable products
- produced evidence that reflected reuse/recycle but did not adequately address economic and social considerations
- explained the life cycle of a material such as cotton, plastic or aluminium without incorporating 'design'
- focused on the historic development of an outcome (Apple iPhone or solar heating)
- failed to explain how design decisions could increase the sustainability of a product
- selected a product that restricted their ability to achieve.

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 sustainability in design
- submitted evidence derived from their own Technological Practice
- conducted an LCA of an existing product and explained the focus for design innovation. This knowledge was often applied within their own development of a sustainable technological outcome
- explained how the competing priorities and compromises were managed within the development and lifecycle of a sustainable technological outcome
- showed an in depth understanding of sustainability in design. In particular, design decisions that impacted on the sustainability of the outcome (both positive and negative).

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:

- emphasised the competing priorities and compromises made as a result of lifecycle analysis in the development of a sustainable technological outcome. This was often evident within naturally occurring evidence where a student was required to address dilemmas and balance conflicting social, environmental and economic factors and demands within their own practice
- demonstrated an independent voice
- showed accurate and comprehensive understanding of sustainability in design
- discussed how life cycle analysis can influence a technologist's design decisions to improve the social, economic or environmental sustainability of an outcome
- discussed their own technological practice, and that of other technologist/s, in relation to sustainability in design.

91367 Demonstrate understanding of advanced concepts relating to

COMMENTARY

Candidates who used social media, such as Facebook were disadvantaged in being able to discuss ethical and legal issues. They primarily described the uploading and sharing of data, but did not have the necessary knowledge to describe their back-up system. As a consequence it was much more difficult for individuals to gain an Achieved grade if they chose organisation whereby they had little access to the information. Some of the main issues around Facebook and sharing of data was not discussed in terms of privacy and legal issues. The candidates that used simple tables were limited in their ability to move forward from Achieved as much of the information was identifying and describing with little consideration of advantages and disadvantages. Much of the Not Achieved did not cover all aspects of the requirements to gain Achieved. For example, where a candidate covered ethical and legal issues there was no reference to back-up procedures. Many did not cover the manipulation of data. So candidates included input and storage but did not go further to describe how that data is manipulated. For example, Kamar was not explained in terms of teachers creating attendance through registers to create reports on attendance for the Ministry of Education.

Candidates that were able to make specific reference to drives and storage in servers or iCloud storage were able to give a fuller description of the file management system. Those that received Merit did so by being able to discuss the negative and positive elements in the system.

Candidates that addressed their Information system by ensuring that they covered all components of the information system – including such as hardware, software, procedures and people in a thorough consideration of its effectiveness were obtaining excellence grade. There were a number of integrated and in-depth consideration of their organisation.

In listing the different components it allowed the candidate to go into detail of the people that would be using the information in the system. Really good examples were given of candidate's own information system within their college. These components included Parents, teachers, candidates and administrators. Candidates were able to identify the information and data being used and how they accessed it. In order to address all elements candidates needed to identify and describe the information systems, such as Kamar, and the parental portals being used. They were also able to describe Google Drive/Ultranet and the sharing of information. A structured approach allowed excellent grade candidates to describe and assess the advantages and disadvantages of the information system. For example, the candidate would describe and identify the grading process and manipulation of individual grades to produce a record. They then went onto describe how this can be used to increase the motivation of candidates by having constant access to reports on their work. Other examples would be the ability of teacher to create reports to view those candidates at risk of not achieving. Administrative staff would use the information management system to prepare wages, bookings and other events.

Candidates that provided a structured report with contents pages and bibliography were more likely to achieve excellence in the grading as they had a well thought out structure. Hence they covered a varied and considered approach to backup. It was unfortunate that there were a number of candidates who provided some clear description of both ethical and legal issues but neglected to add anything in relationship to back-up.

Legal and ethical issues were addressed in more depth than other areas for this standard. There was reference to copyright and a good use of technical terms. Digital ownership and Creative Commons were discussed, along with user acceptance policies. Reference is made to governmental legislation with, for example the Privacy Act 1993, and its implications for the organisation. To achieve excellence the candidate needs to assess is effectiveness. Candidates that obtained excellence were able to identify security risk related to privacy and describe the need for the system to be improved by informing and reminding people within the information system to ensure that they adhere to legislation. Back-up procedures were outlined and assessed for its implication in the safety of data. Excellent candidates were able to assess whether the different back up procedures were effective and compared and contrasted the different procedures.

ACHIEVEMENT

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

- used an organisation to which they had access to information required to address the issues of the standard
- understood the file management considerations of the information system
- Identified all aspects of input, storage, retrieval and manipulation of data
- identified information management systems at their chosen organisation
- addressed at least two ethical and legal issues
- stated backup procedures
- described the input, storage, manipulation of data
- defined concepts and understanding was evident in the papers.

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:

- showed a narrow understanding of file management considerations
- gave only one description for ethical and legal issues
- omitted information on how data is manipulated
- omitted to identify either Ethical or Backup procedures
- describe an organisation where they would not have access to the information to complete the requirements of the standard
- combined the assessment with database management, but did not address the requirements of the standard
- rote learning that did not cover all requirements
- missed out on specific requirements of the standard, including input/output/storage/retrieval and back-up
- concentrated upon the Dynamically linked data standard
- discussed how a database was created rather than addressing the requirements of the standard
- does not cover ethical issues for example, limited to copy right only
- often quite clear a teacher gave the students direction/questions to complete and not all elements included.

ACHIEVEMENT WITH MERIT

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

- description of backup includes data stored on a PC and or network and shared information such as MUSAC or KAMAR
- gave implications of back-up with shared information
- considered advantages and disadvantages for shared information within an organisation
- identified information management systems at their chosen organisation
- gave examples of how data was manipulated
- stated backup procedures and why they were necessary
- discussed the advantages and disadvantages and gave examples
- discussion and consideration of backup and ethical with the information system
- gave examples of how data was manipulated.

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:

- integrated comparisons to other organisations in the evaluation
- discussed issues with their chosen organisations information management e.g. no off-site backup
- supplied examples of the Information system
- a clear and detailed discussion of the procedures and conventions for privacy and permissions
- gave a full evaluation of the Information system, including all elements of conventions for privacy, back-up procedures and its effectiveness.
- compared the systems effectiveness in relation to the input, storage, manipulation and retrieval of data
- listed key staff involved and what their roles were.

91371 Demonstrate understanding of advanced concepts from computer science

COMMENTARY

Candidates who clearly demonstrated understanding of advanced concepts from computer science wrote in their own voice, provided evidence from their own investigations to support factual and referenced material.

Candidates who simply reproduced information from Internet sites or teacher notes often did not demonstrate their own understanding.

Candidates who reproduced supplied or sourced material without relating the identified knowledge to a specific context such as a digital device, often did not demonstrate their own understanding.

Annotated photographs and diagrams developed by candidates assisted them to demonstrate their understanding.

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

Candidates who produced neatly formatted documents were advantaged as this contributed to their demonstration of understanding. Some candidates did not reference sourced information in the submission. Some students had narrow margins or smaller font to fit into the 14 page maximum.

ACHIEVEMENT

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

- described ways in which different types of data could be represented using bits, such as text, colour, audio, numbers, images, etc.
- described the concept of encoding information using compression coding and described typical uses of compression coding such as images, audio, etc.
- described the concept of encoding information using error control coding and described typical uses of error control coding such as parity, ISBN, etc.
- described the concept of encoding information using encryption and described typical uses of encryption such as protecting the confidentiality and integrity of sensitive user data
- provided examples from human-computer interfaces, such as a chosen device, and described how the examples illustrate usability heuristics
- described ways in which different types of data could be represented using bits, such as text, colour, audio, numbers, images, etc.
- described the concept of encoding information using compression coding and described typical uses of compression coding such as images, audio, etc.
- described the concept of encoding information using error control coding and described typical uses of error control coding such as parity, ISBN, etc.
- described the concept of encoding information using encryption and described typical uses of encryption such as protecting the confidentiality and integrity of sensitive user data
- did not attempt the Merit and Excellence questions from the standard.

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 only one or two of the three required concepts of Data Representations, Encoding, and Usability Heuristics
- described only one or two of the three required concepts of encoding: Compression coding, Error control coding, and Encryption
- described only one way in which different types of data could be represented using bits, such as text, numbers, images, etc.
- copied material verbatim from other sources (particularly the internet) and, in doing so, failed to show their own understanding

- copied material verbatim from other sources and did not differentiate between copied data and their own understanding
- lacked detail in their descriptions
- attempted to paraphrase without understanding
- used the allowed pages unnecessarily with cover sheets or extensive printouts of device specifications, or tables of data from the Internet.

ACHIEVEMENT WITH MERIT

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

- compared and contrasted different ways in which different types of data could be represented using bits; such as ASCII and Unicode, 8 bit and 24 bit colour, etc., and discussed the implications
- discussed how a widely used technology was enabled by one or more of compression coding, such as JPEG, ZIP, etc.; or error control coding such as ISBN, etc.; or encryption, such as internet banking, email, etc.
- observed others using a given human-computer interface, such as a chosen device, software application, etc., so that they could evaluate the human-computer interface against Nielsen's usability heuristics
- used annotated photographic or diagrammatic evidence to demonstrate their understandings
- gave detailed and personalised answers to the questions.

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:

- evaluated a widely used system for compression coding such as ZIP, or error control coding such as ISBN, or encryption such as e-mail message encryption technologies
- suggested a number of relevant improvements to a given human-computer interface such as their chosen device, based on their evaluation of the HCI in terms of Nielsen's usability heuristics
- wrote in their own voice, providing evidence from their own experiences to support any factual or referenced material
- used 'student voice' related to their own investigations to show comprehensive understanding
- produced neatly formatted documents as this contributed to their demonstration of understanding
- conducted personalised experiments to demonstrate their understanding.