Engineering 2019 v1.1

Unit 2 sample assessment instrument

April 2018

Project — folio

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Schools develop internal assessments for each senior subject, based on the learning described in Units 1 and 2 of the subject syllabus. Each unit objective must be assessed at least once.

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. recognise and describe the assistive technology problem, engineering technology knowledge, and mechanics, materials science and control technologies concepts and principles, in relation to emerging technologies
2. symbolise and explain ideas and solutions in relation to emerging technologies
3. analyse the assistive technology problem, and information in relation to emerging technologies
4. determine solution success criteria for the assistive technology problem
5. synthesise information and ideas to predict possible emerging technologies solutions
6. generate an emerging technologies prototype solution to provide data to assess the accuracy of predictions
7. evaluate and refine ideas and solutions to make justified recommendations
8. make decisions about and use mode-appropriate features, language and conventions to communicate development of solutions.

Queensland Government | Queensland Curriculum & Assessment Authority

For all Queensland schools

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Subject	Engineering
Technique	Project — folio
Unit	2: Emerging technologies
Topic	1, 2, 3 and 4

Part A documents the development of a solution to the assistive technology problem. Part B provides the Australian assistive technology agency with a concise account of the preferred emerging technologies solution drawn from Part A documentation.

Conditions

Duration	5–7 weeks		
Mode	Multimodal: written, visual	**Length**	Part A: 7–9 single-sided A3 pages or equivalent digital media Part B: 2–3 single-sided A4 pages or equivalent digital media
Individual/ group	Individual	**Other**	The table of contents and reference list are not included in the page count
Resources available	—		

Context

The Australian population is ageing. The Australian Government's Treasury Department states that 'over the next 40 years, the proportion of the population over 65 years [of age] will almost double to around 25%' and the proportion over the age of 85 years will increase even more rapidly (www.demographics.treasury.gov.au/content/_download/australias_demographic_challenges/html/adc-04.asp). This situation will increase the need to use emerging technologies to develop assistive technologies that support people as they become less able to perform rudimentary and more complex everyday tasks, for example turning handles and knobs on doors, lifting and pouring bottled liquids. In the future, many more people are expected to stay at work well past the current retirement age of 65 years. There are agencies that provide older Australians with advice regarding how assistive technologies may help them reduce the difficulties in their everyday or work life.

An appropriate problem in this context is one that:

- requires an engineered solution that includes multiple moving components, e.g. a mechanism that provides a severely arthritic person with an opportunity to perform a range of specified tasks
- requires the use of emerging technologies in the solution to the assistive technology problem
- is adaptive in that it can be modified to suit a circumstance that changes over time.

Task

Your task is to use the problem-solving process in Engineering to:

- develop an emerging technologies solution that supports a person over 65 years of age to more easily perform an everyday task
- document the problem-solving process used to predict the reliability of the emerging technologies solution to the assistive technology problem in a folio
- provide an Australian assistive technology agency with a summary report of the preferred emerging technologies solution.

The folio will include a complete or partial virtual or actual prototype of the assistive technology solution to provide performance data.

To complete this task, you must:

Part A

- recognise and describe
  - the characteristics of the assistive technology problem, including knowns, unknowns, assumptions and boundaries
  - the engineering mechanics, materials science and control technologies fundamentals of the assistive technology problem
  - mitigation of environmental and sustainability impacts associated with the assistive technology problem, including corrosion, life cycle assessment, safety, pollution, maintenance and energy efficiency
- symbolise and explain ideas and the solution to the assistive technology problem using annotated sketching, drawings including basic drawing standards (hand or CAD), logic and electrical circuit diagrams, flow charts and free-body diagrams, graphs, tables and/or schemas
- analyse the assistive technology problem and engineering mechanics, materials science, and control technologies, technology and research information in relation to emerging technologies to identify the elements, components and features, and their relationship to the structure of the problem, including project management milestones (i.e. resource and time constraints)
- determine solution success criteria, considering the identified elements, components and features, and their relationship to the structure of the assistive technology problem, including for example performance index, speed, weight, aerodynamics, power
- synthesise engineering mechanics, materials science, control technologies, technology and research information and ideas to predict a possible solution to the assistive technology problem
- evaluate and refine ideas and solution development in relation to solution success criteria including
  - testing of materials and processes, e.g. pulleys and gear testing, friction, solar panel efficiency, motor efficiency
  - calculations using mechanics concepts and principles to predict prototype solution performance, including predicted mass, velocity, acceleration and efficiency
  - evaluation of prototype solution performance data and the reliability of the prototype solution, including use of performance index, speed, weight, aerodynamics and power
- generate the prototype solution for testing including
  - virtual and/or physical manipulation of materials, scaled modelling, 3D printing, laser cutting
  - annotations on photographs or screen captures of the prototype solution prior to and after testing
  - performance of destructive, non-destructive and/or virtual testing of the prototype solution to provide performance data
- recommend and justify future modifications or enhancements to ideas and the solution to the assistive technology problem
- communicate the development of ideas and the solution for the assistive technology problem using written and visual features, e.g. PMI (plus, minus, interesting) charts, sketches, drawings, diagrams, graphs, tables and/or schemas
- communicate data using diagrams, tables and/or spreadsheets.

Part B

- develop a summary report for an Australian assistive technology agency drawn from Part A documentation. The summary report includes key pictures, tables, graphs, sketches and drawings that provide a concise account of the preferred solution to the assistive technology problem, including key features and any recommendations made to inform future solution development.

Stimulus

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Checkpoints

☐ A student draft will be required for submission during week 3 of the allocated assessment time and will include an exploration of the assistive technology problem, the development of ideas and an indication of a proposed solution.

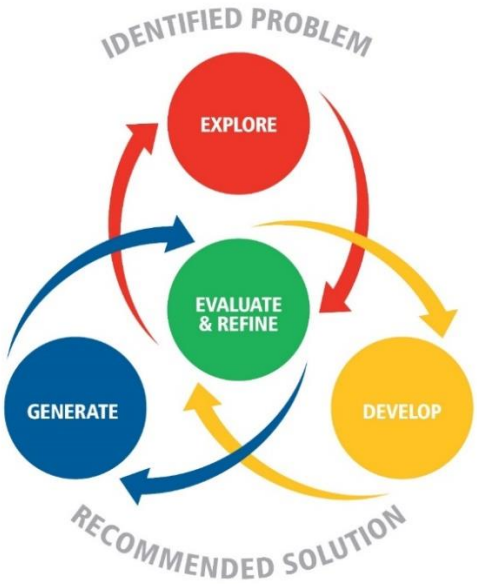
Feedback

Authentication strategies
• The teacher will provide class time for task completion.
• Students will each produce a unique response through teacher monitoring of student problem identification and problem-solving.
• Students will provide documentation of their progress at the indicated checkpoint.
• The teacher will conduct interviews or consultations with each student as they develop the response.
• Students must acknowledge all sources.
• Students must submit a declaration of authenticity.
• The teacher will ensure class cross-marking occurs.

Scaffolding

In Engineering, a folio involves students documenting the application of a problem-solving process in response to an identified real-world problem.

The problem-solving process in Engineering



The response will include the following folio and referencing conventions:

- headings that organise and communicate the student's thinking through the iterative phases of the problem-solving process in Engineering
- a table of contents page
- a reference list and a recognised system of in-text referencing.