Science in Practice 2019 v1.0

Sample assessment instrument

July 2018

Project — Heat-efficient house

Information for teachers

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

Schools develop internal assessments for each Applied subject, based on the learning and assessment described in the approved study plan.

Purpose of the project

This technique assesses a response to a single task, situation and/or scenario in a module of work that provides students with authentic and/or real-world opportunities to demonstrate their learning. The student response will consist of a collection of at least two different assessable components, demonstrated in different circumstances, places and times, and may be presented to different audiences, and through differing modes.

Further information about the specifications for this assessment technique can be found in the Assessment techniques section of the Science in Practice syllabus.

Assessment dimensions

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

- Knowing and understanding
- Analysing and applying
- Planning and evaluating

In Science in Practice, all objectives from each dimension must be assessed in each Project.

Subject	Science in Practice
Technique	Project — Heat-efficient house
Unit number and module number and name	**Unit:** 4 **Module:** 7. Heat-efficient houses

Conditions	**Units 3–4**
Written component	500–900 words
Product component	Model of heat-efficient house
Multimodal component • presentation	3–6 minutes
Further information	
Duration (including class time)	6 weeks
Individual/group	Individual
Resources available	35 x 25 cm plywood base for the model. Laboratory time and equipment for testing.

Context

Solutions to humanity's energy and resource challenges are likely to come from the application of science and technology. In this module you have learnt about natural and synthetic materials, and studied heat and temperature, energy transfer (conduction, insulation, materials and their properties) and house design. You have explored how designers use the thermal properties of materials and the physical processes associated with heat to construct heat-efficient buildings.

Task

Plan, build, evaluate and refine a heat-efficient model house suited to conditions in South-East Queensland. Complete the task with a focus on the energy efficiency of the design features and types of materials to keep the model house cool in summer and warm in winter.

The task includes three components.

- Component 1: Written — Design proposal for model house
- Component 2: Product — Model of heat-efficient house
- Component 3: Multimodal — Short video reporting outcomes of testing

To complete this task, you must:

Component 1: Written — Design proposal for model house

- design a plan for a model house that will stay cool in summer and warm in winter, to fit on an area of 35 x 25 cm
- describe and explain how the design and materials maximise energy efficiency, including
  - site location and house direction
  - size and type of house, e.g. number of rooms, other features
  - at least one passive design feature and its placement, e.g. windows, doors, insulation, eaves, verandas
  - at least one material used, e.g. for the roof, walls, windows, doors, floor coverings or any extensions
- use scientific terminology, diagrams, conventions and symbols in your design proposal.

Component 2: Product — Model of heat-efficient house

- Build stage
  - apply scientific knowedge to build your proposed model of a heat-efficient house using a small cardboard box or similar
- Test stage
  - decide on the test conditions to be used for a typical summer and winter day in South-East Queensland
  - simulate these conditions and test the model house to record temperature readings both inside and outside
  - record results and photograph the model house, showing the design features that were tested
- Refinement stage
  - analyse the data and evaluate the best options for improving the heat efficiency of the model house, considering heat efficiency in terms of actually living in the house
  - apply your scientific knowledge to modify and retest the model house using the same summer and winter day conditions
  - record the plans, modifications and results as scientific evidence to be used in the multimodal presentation

Component 3: Multimodal presentation — Short video reporting outcomes of testing

- describe and explain the scientific skills, techniques, methods and risks involved in making the model house heat efficient
- report your analysis of the data on heat efficiency using tables and graphs
- report your evaluation of the plans and modifications made for improving heat efficiency
- use scientific evidence to reach a conclusion about the heat-efficient features that were tested
- recommend modifications to improve future outcomes.

Checkpoints

- ☐ Term [X] Week [X]/[Date]: Complete draft of design proposal
- ☐ Term [X] Week [X]/[X]: Submit design proposal and material requisition form
- ☐ Term [X] Week [X]/[X]: Discuss progress of model construction and data collection with teacher
- ☐ Term [X] Week [X]/[X]: Submit model and check progress of video with teacher
- ☐ [Due date]: Submit video

Authentication strategies

Your teacher will use ways to check that the work you are assessed on is your own work.

- Discuss with your teacher or provide documentation of your progress at indicated checkpoints.
- Your teacher will observe you completing work in class.
- Take part in interviews or consultations with your teacher as you develop your response.
- Submit drafts and respond to teacher feedback.
- Acknowledge all sources used.
- Submit the declaration of authenticity.

Instrument-specific standards matrix

	Standard A	Standard B	Standard C	Standard D	Standard E
Knowing and understanding	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:
	• comprehensive description and explanation of scientific facts, concepts and phenomena in a range of situations including some that are unfamiliar	• detailed description and explanation of scientific facts, concepts and phenomena in familiar situations	• description and explanation of scientific facts, concepts and phenomena in familiar situations	• description of simple scientific facts, concepts and phenomena	• statements about simple scientific facts and phenomena
	• coherent description and explanation of scientific skills, techniques, methods and risks.	• detailed description and explanation of scientific skills, techniques, methods and risks.	• description and explanation of scientific skills, techniques, methods and risks.	• description of scientific skills, techniques, methods and risks.	• statements about simple scientific skills, techniques, methods and risks.
Analysing and applying	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:
	• comprehensive analysis of data, information, situations and relationships	• detailed analysis of data, information, situations and relationships	• analysis of data, information, situations and relationships	• description of data, information, situations and relationships	• statements about simple data, information, situations and relationships
	• application of scientific knowledge, understanding and skills to generate justified solutions in a range of situations including some that are unfamiliar	• application of scientific knowledge, understanding and skills to generate informed solutions in familiar situations	• application of scientific knowledge, understanding and skills to generate solutions in familiar situations	• partial application of simple scientific knowledge, understanding and skills	• superficial application of simple scientific knowledge, understanding and skills
	• clear and coherent communication using scientific terminology, diagrams, conventions and symbols.	• effective communication using scientific terminology, diagrams, conventions and symbols.	• communication using scientific terminology, diagrams, conventions and symbols.	• basic communication using aspects of scientific terminology, diagrams, conventions and symbols.	• basic communication using everyday language.

Planning and evaluating	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:	The student work has the following characteristics:
	• considered planning of scientific activities and investigations	• effective planning of scientific activities and investigations	• planning of scientific activities and investigations	• planning of aspects of scientific activities and investigations	• statements about aspects of scientific activities and investigations
	• systematic evaluation of the reliability and validity of plans and procedures, and data and information	• detailed evaluation of the reliability and validity of plans and procedures, and data and information	• evaluation of the reliability and validity of plans and procedures, and data and information	• statements about the reliability and validity of simple plans and procedures, and data and information	• statements about aspects of reliability and validity
	• valid conclusions, decisions and recommendations justified with scientific evidence.	• informed conclusions, decisions and recommendations linked to scientific evidence.	• conclusions, decisions and recommendations using scientific evidence.	• conclusions, decisions and recommendations.	• statements of personal opinion.