Earth & Environmental Science 2019 v1.3

Unit 1 sample assessment instrument

August 2018

Student experiment

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.

Unit objectives

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

2. apply understanding of Earth systems and models and the development of the geosphere, atmosphere, hydrosphere and biosphere
3. analyse evidence about Earth systems and models and the development of the geosphere, atmosphere, hydrosphere and biosphere
4. interpret evidence about Earth systems and models and the development of the geosphere, atmosphere, hydrosphere and biosphere
5. investigate phenomena associated with Earth systems and models and the development of the geosphere, atmosphere, hydrosphere and biosphere
6. evaluate processes, claims and conclusions about Earth systems and models and the development of the geosphere, atmosphere, hydrosphere and biosphere
7. communicate understandings, findings, arguments and conclusions about Earth systems and models and the development of the geosphere, atmosphere, hydrosphere and biosphere

Note: Objective 1 is not assessed in this instrument.

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For all Queensland schools

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Subject	Earth & Environmental Science		
Technique	Student experiment		
Unit	Unit 1: Introduction to Earth systems		
Topic	Topic 1: Earth systems and models Topic 2: Development of the geosphere Topic 3: Development of the atmosphere and hydrosphere Topic 4: Development of the biosphere		
Conditions			
Duration	10 hours class time		
Mode	Written response — scientific report	**Length**	1500–2000 words
Individual/ group	Group work with individual report	**Other**	—
Resources available	School science laboratory and library (online: internet and school intranet, databases, journals)		

Context

You have completed the following practicals in class:

- Identify examples of sedimentary, igneous and metamorphic rocks from the local or regional environment using key-based classification.
- Use local soil samples to measure soil properties to classify and assess quality, including organic content, pH, moisture content, soil texture and structure.
- Use secondary data to interpret stratigraphic sequences and infer relative age relationships of fossils and/or sediments.
- Use relevant standard measures (e.g. grain size, shape and sorting charts, felsic vs. mafic composition, and an acid test for carbonate) to collect and organise data about rock samples.
- Interpret data to make connections between indicator plant species and land use with specific soil types (e.g. field-based or satellite imagery data).
- Collect, organise and interpret data about the properties of water in relation to important Earth system processes.
- Use standard apparatus and techniques to collect, organise and interpret data about meteorological conditions.
- Collect and analyse data about the characteristics of a community by using a transect study (i.e. quadrats).
- Model the process of the formation of different depositional environments.

Task

Modify (i.e. refine, extend or redirect) an experiment in order to address your own related hypothesis or question.

You may use a practical performed in class, a related simulation or another practical related to Unit 1 (as negotiated with your teacher) as the basis for your methodology and research question.

To complete this task, you must:
• identify an experiment to modify* • develop a research question to be investigated* • research relevant background scientific information to inform the modification of the research question and methodology • conduct a risk assessment and account for risks in the methodology* • conduct the experiment* • collect sufficient and relevant qualitative and/or quantitative data to address the research question* • process and present the data appropriately • analyse the evidence to identify trends, patterns or relationships • analyse the evidence to identify uncertainty and limitations • interpret the evidence to draw conclusion/s to the research question • evaluate the reliability and validity of the experimental process • suggest possible improvements and extensions to the experiment • communicate findings in an appropriate scientific genre, i.e. scientific report. * The steps indicated with an asterisk above may be completed in groups. All other steps must be completed individually.
Stimulus
—
Checkpoints
☐ Term 1 Week 6: Select modifications, develop research question and complete risk assessment.
☐ Term 1 Week 7: Start experiment.
☐ Term 2 Week 3: Collect and analyse data.
☐ Term 2 Week 4: Submit draft.
☐ Term 2 Week 8: Submit final response.
Feedback
Authentication strategies
• The teacher will provide class time for task completion.
• Students will provide documentation of their progress at indicated checkpoints.
• The teacher will collect and annotate drafts.
• Students will use plagiarism-detection software at submission of the response.
• Students must acknowledge all sources.
• The teacher will compare the responses of students who have worked together in groups.

Scaffolding

The response must be presented using an appropriate scientific genre (i.e. scientific report) and contain:

- a research question
- a rationale for the experiment
- reference to the initial experiment and identification and justification of modifications to the methodology
- raw and processed qualitative and/or quantitative data
- analysis of the evidence
- conclusion/s based on the interpretation of the evidence
- an evaluation of the methodology and suggestions of improvements and extensions to the experiment
- a reference list.

An example of how one of the practicals could be modified to develop a research question

Practical that will be modified: Use local soil samples to measure soil properties to classify and assess quality, including organic content, pH, moisture content, soil texture and structure.

Research question: How does changing the level of soil nitrogen affect the vegetative growth of sweet corn (*Zea mays*)?

Developing the research question:

Description	Example
Identify the independent variable to be investigated	Change in level of soil nitrogen
Identify the dependent variable	Mass of vegetative dry matter of sweet corn
Identify the methodology to be used	Field trial
Draft research questions	• Why is nitrogen important for vegetative growth of plants? • Will the plant respond to different levels of nitrogen in the soil? • Which plants require significant amounts of nitrogen in the soil?
Refine and focus the research question	Will changing the level of nitrogen available have a significant effect on vegetative growth of plants?
Present research question to teacher for approval	How does changing the level of soil nitrogen affect the vegetative growth of sweet corn (*Zea mays*)?

Note: You cannot use this sample research question for your experiment.