2021 Scientific Studies Subject Assessment Advice

Overview

Subject assessment advice, based on the previous year’s assessment cycle, gives an overview of how students performed in their school and external assessments in relation to the learning requirements, assessment design criteria, and performance standards set out in the relevant subject outline. They provide information and advice regarding the assessment types, the application of the performance standards in school and external assessments, and the quality of student performance.

Teachers should refer to the subject outline for specifications on content and learning requirements, and to the subject operational information for operational matters and key dates.

School Assessment

Assessment Type 1: Inquiry Folio

The Inquiry Folio must include three tasks with a focus on science inquiry skills (to a maximum of 12 single-sided A4 pages, or equivalent, with a minimum of 10 point font), one investigation with a focus on science as a human endeavour, and one individual inquiry design proposal (to a maximum of four single‑sided A4 pages).

Although in 2020, Board-approved changes due to COVID-19 were permitted to allow a reduction in the number of SIS tasks, this was not implemented in 2021.

The more successful responses commonly:

* deconstructed an idea/ question that identified and explored a range of variables/changes in detail and then designed a complex investigation focused on a question or problem extrapolated from the deconstruction
* devised a suitable method for an engineering design proposal that aimed to improve the functionality or performance of a prototype for an identified problem or purpose and indicated how this would be scientifically tested
* provided evidence of data collection and representation using an appropriate type and number of tables and graphs, including appropriate titles, labels and trend lines
* identified trends in patterns of data and explained this using appropriate scientific concepts and knowledge
* identified contextual errors that were specific to the task (rather than generic errors) and discussed the impact of these errors on data or, in the case of a design, identified specific faults or failures in the design and the impact these had
* used appropriate terminology consistently when discussing errors (validity, accuracy, precision, reliability etc.)
* used a range of research and resources to support their conclusions with good scientific understanding
* adhered to the page count, word or time limit, and font size as specified in the subject outline.
* submitted a relevant SHE report about a contemporary aspect of science, elaborating on one or more of the key concepts to demonstrate a deep understanding of the interaction between science and society

The less successful responses commonly:

* used extensive scaffolding that limited student exploration of the task to demonstrate the depth and breadth of their capability
* included a proposal for an investigation for which the outcome was not uncertain. This presented a poor, or limited deconstruction of the problem with minimal discussion of the possible variables or variations to consider in the design
* did not indicate how the results of the proposed investigation or the success of the engineering design would be measured or identified
* did not include quantitative results only qualitative
* provided limited scope for students to demonstrate evidence of achievement standards. For example, in SIS tasks where students were required to provide evidence of IAE3, but only one question was provided to enable this
* used an engineering design approach that gave a limited opportunity to conduct an investigation and improve on the design/model
* included excessive amounts of raw data in their table instead of averages (or other analysed data)
* featured data that was displayed in an incorrect format or graph type, limiting how students interpreted the graph and therefore the accuracy of any conclusions
* identified the strengths and weaknesses of an investigation or suggested improvements. These are not requirements of the current subject outline. Improvements would be integral to testing and modifying an engineering design and the success or otherwise of these should part of the evaluation of the process
* drew conclusions from insufficient data points to justify their results or conclusion
* required limited complexity from the student and therefore restricted their capacity to demonstrate evidence of achievement above a ‘C’ grade
* used tasks which were not fit for purpose. For example, tasks from other subjects or old Scientific Studies course assignments
* submitted a SHE report that provided minimal detail of the interaction between science and society, or was largely a research task that talked about how a new technology/discovery might have an impact.

Assessment Type 2: Collaborative Inquiry

In this assessment type, students provide evidence of their collaboration to design and conduct an investigation related to the program and for which the outcome is uncertain. They record individually, in a personal journal the initial thinking, formulation of the questions and deconstruction of the problem, their own and other group members’ contribution to the scientific investigation or engineering solution.

The more successful responses commonly:

* investigated an idea or concept for which the outcome was uncertain
* included sections within the report (e.g. deconstruction, planning, method, iterations, improvements, etc.)
* provided evidence of collaboration using a variety of methods (e.g. journal, spreadsheet, screen shots)
* included documentation of discussions made with group members identifying problems and justifying decisions made
* included evidence with justification of the progress of the investigation (e.g. data collected, notes, annotated photographic evidence, or evidence of multiple testings/iterations)
* included sophisticated graphs with appropriate conventions which were well labelled that matched the aim of the investigation (e.g. line graphs for continuous data, bar graphs for discontinuous data)
* evaluated the investigation that was undertaken rather than reflecting on the investigation
* presented a pitch that did not simply repeat what was in the journal; combined a PowerPoint and audio in a pitch that is less than 5 minutes
* provided a separate pitch and investigation that followed the criteria for the task
* evaluated the role that the writer undertook during the inquiry and included an evaluation of collaboration with members of the community where this was appropriate
* considered and reflected on how collaboration contributed to the group’s success with specific examples.

The less successful responses commonly:

* were simulation-based, resulting in the inability to design and refine an outcome uncertain investigation
* resulted from investigations that had limited engineering or scientific inquiry, hence restricting the quality of the student evidence
* featured generic engineering tasks that provided little overall achievement or data to comment on effectiveness of design
* conducted an investigation for which the outcome was predictable and used a method that had limited detail
* resulted from investigations that were closed or linear. Additionally, investigations where an entire class completed the same experiment or design, limited students’ ability to go into depth for IAE1, especially at the higher grade-bands
* completed a scenario-based activity where students did not complete an investigation using either a scientific method or engineering design process, instead solving a problem using a mathematical modelling process where input values were used to calculate hypothetical solutions
* retrospectively created a journal that lacked background information relating to the study and/or any evaluation of the procedures used
* described the collaboration of group members rather than evaluated the effectiveness and its impact on results/outcomes
* did not consider how the collaboration contributed to the successful or unsuccessful outcome of the investigation
* submitted a traditional practical report rather than a journal
* read the text in a PowerPoint presentation or repeated the same information that was to be found in the journal, rather than made a pitch
* did not include a pitch either as a recorded oral or as a multimedia presentation.

External Assessment

Assessment Type 3: Investigation

In this assessment type, students provide evidence of having undertaken one individual inquiry using the proposal developed and assessed in Assessment Type 1: Inquiry Folio. Students use the design proposal (incorporating changes made as a result of the feedback, if appropriate) from Assessment Type 1: Inquiry Folio to conduct a practical investigation for which the outcome is uncertain. They produce a report in which they that summarise the proposal, identify any modifications made to the procedure as a result of feedback from the teacher, analyse the data obtained, and evaluate the method or model(s) used. If the results are unexpected, the student discuss the reasons for these results as part of their evaluation using the format specified in the subject outline.

The more successful responses commonly:

* included a succinct summary of the design of the investigation or model enabling the results in the report to be readily interpreted
* a brief but scientific introduction that contained several references to credible scientific journals
* were original in nature and not ‘run of the mill’ science experiments (e.g. enzyme and motion practicals)
* tested a feature of their design prototype when completing an engineering design task
* had a clearly stated a hypothesis in the correct format
* had a large sample of data which was collated and presented in a summarised table. This data was then used to create an appropriate graph (line, bar etc). The title was specifically focused on the aim of the experiment. All labels were accurate and contained appropriate units
* analysed trends in the data to identify patterns. These patterns were then evaluated in the context of the experiment using appropriate scientific knowledge and concepts
* provided a clear analysis of the primary data by showing a clear understanding of accuracy, precision and reliability in the context of their investigation
* identified contextual errors that were specific to the task and discussed the impact of these errors on data or, in the case of a design, identified specific faults or failures in the design and the impact these had
* used appropriate terminology consistently when discussing errors (validity, accuracy, precision, reliability etc.)
* used in-text referencing, provided a reference list at the end of their investigation and, used appropriate terms, conventions and representations highly effectively.

The less successful responses commonly:

* featured a lengthy introduction and method which reduced the available word count for analysis, evaluation and conclusion, impacting on the assessment of these sections
* chose investigations that could not collect ‘real time’ data
* selected investigations that were potentially unethical, such as blood lactate or those that had no clear independent variable but rather, just an observation of a single outcome
* gathered data for two dependent variables or collected data that was inconsistent with the dependent variable stated in the hypothesis
* collected subjective or categoric data that was difficult to analyse and/or evaluate
* represented their findings using photographic evidence alone (qualitative)
* represented data unconventionally in tables and graphs, which often included control variables or more than one dependent variable
* incorrectly or inconsistently labelled tables and graphs
* included multiple, repetitive individual tables and/or graphs which could have been combined
* provided only a description of the data without identifying a trend or pattern and without linking this to scientific theory
* used excessive statistical justification of their data, including the explanation of standard deviation and r2 calculations without evidence of their understanding of these processes
* provided conclusions that were unrelated to the hypothesis they were investigating
* showed confusion between what random and systematic errors are and did not link these to their effect on the data
* misused terminology when evaluating their method (i.e. random, systematic, precision, reliability, validity and accuracy).