# Government of South Australia LogoSACE Board Logo2023 Scientific Studies Subject Assessment Advice

Overview

1. Subject assessment advice, based on the 2023 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.
2. 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

Teachers can improve the moderation process and the online process by:

* thoroughly checking that all grades entered in school online are correct
* ensuring the uploaded tasks are legible, all facing up (and all the same way), and remove blank pages, student notes and formula pages
* ensuring the uploaded responses have pages the same size and in colour so teacher marking and comments are clear
* submitting all tasks per assessment type in one document preferably a PDF
* because of the high number of tasks in Assessment Type 1, moderators found it helpful when teachers provided highlighted performance standards after individual tasks within student folios.

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).

Teachers can elicit more successful responses by:

* utilising the ideas from the subject outline to consider innovative task ideas
* utilising data tasks in a comprehensive and complex way
* practicing deconstructing and designing experiments prior to the design proposal
* utilising PLATO to find updated examples of SHE investigations and potential ideas
* supporting creativity in tasks by designing open tasks to support student interests (reduce the narrow scaffolded tasks)
* understanding the implications of task design on data collection and therefore the ability to discuss trends and data accuracy
* having a deep understanding of the science before starting topics.

The more successful responses commonly:

* deconstructed a problem that involved a broad range of ideas and potential variables with links to scientific concepts and justification
* 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 (specifically what data would be obtained)
* provided evidence of data collection and representation using an appropriate type and number of tables and graphs, including appropriate titles, labels, and trend lines
* used data to identify specific errors in the data set and then proposed reason/s for why this occurred
* 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 and dynamic 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/direction 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 certain. 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 and obtain data
* 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
* used personal terms and conventions when discussing their investigation or report.

Assessment Type 2: Collaborative Inquiry

1. 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.
2. Teachers can elicit more successful responses by:

* developing collaboration skills throughout the year and evaluation of these
* providing a range of ways that students can evaluate collaboration in their context
* supporting students to understand how to write journal entries
* practising recording presentations.

The more successful responses commonly:

* utilised the evaluation to summarise the investigation and analyse the effectiveness of collaboration on deconstruction, design and collecting data.
* wrote succinct journal entries to reduce the page count
* 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
* utilised and referenced research to support findings
* 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:

* provided a recount of what the group did without evaluating the effectiveness of collaboration on the process
* rated individuals for how often they were present and expressed their ideas rather than their effect on collaboration
* 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 the effectiveness of the 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.

Operational Advice

If students, in either Assessment Type 1 or Type 2, present their responses in oral or multimodal form, 6 minutes is the equivalent of 1000 words. Students should not speed-up the recording of their videos excessively in an attempt to condense more content into the maximum time limit.

From 2023, if a video is flagged by moderators as impacted by speed, schools will be requested to provide a transcript and moderators will be advised to moderate based on the evidence in the transcript, only considering evidence up to the maximum word limit.

If the speed of the recording makes the speech incomprehensible, it affects the accuracy of transcriptions and it also impacts the ability of moderators to find evidence of student achievement against the performance standards.

External Assessment

Assessment Type 3: Investigation

1. 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 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 discusses the reasons for these results as part of their evaluation using the format specified in the subject outline.
2. Teachers can elicit more successful responses by:

* providing feedback to students to remove personal pronouns in all scientific investigations
* focusing student ideas on areas that are outcome uncertain
* only testing one variable
* limiting the scaffolding so that students can demonstrate knowledge and creativity
* ensuring that each student develops an individual design and not a group investigation
* limiting ethical issue investigations – blood lactate, animal investigations, caffeine etc.
* checking the science before approving ideas for investigation
* considering how and what data will be collected by the student and if this data can then be analysed for trends accurately and appropriately with links to science (try to avoid categorical data investigations)
* where the investigation will be collecting qualitative data there also needs to be quantitative data.

The more successful responses commonly:

* included a concise summary of the design of the investigation or model
* a brief but sophisticated scientific introduction that contained several references to credible scientific journals with links to the investigation
* were ”outcome uncertain” and not prescribed Biology, Chemistry or Physics practicals
* tested the effect of one variable
* engineering focus - tested a feature of their design prototype (data obtained)
* designed experiments or engineering projects that obtained accurate and relevant data sets that could be analysed
* had a clearly stated hypothesis in the correct format
* had a large sample of data which was collated and presented in a summarised table with accurate headings and set out appropriately
* data was used to create an appropriate graph (line, bar etc). The title was specifically focused on the aim of the experiment. For example, the effect of recovery time (independent variable) on aerobic performance (dependent variable). 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 and related back to existing research
* provided a clear analysis of the primary data by accurately explaining 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.)
* related the observations of the investigation back to the hypothesis and appropriately summarised the outcome of the investigation in the conclusion
* consistent justification of thoughts and observations made throughout the investigation supporting using appropriate referencing.
* 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:

* designed investigations with no scientific relevance or purpose or incorrect science
* designed an investigation with multiple variables to be tested or outcome certain (e.g. enzyme, germination, etc)
* featured a lengthy introduction and method
* chose investigations that could not collect ‘real-time’ data (e.g. simulations)
* designed investigations where the data was limited to a small sample size e.g. sports science (testing students in the classroom) and decomposition due to the number of variables impacting the data, therefore impacting the validity of the results and ability to find trends.
* selected investigations that were potentially unethical, such as animal experiments, blood lactate or caffeine consumption 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 (rating scale, pictures etc)
* represented data unconventionally in tables and graphs, which often included controlled variables or more than one dependent variable
* incorrectly or inconsistently labelled tables and graphs or graph types
* misused line of best fit or type of line in data representations
* included multiple, repetitive individual tables and/or graphs that could have been combined
* provided only a description of the data without identifying a trend or pattern and without linking this to scientific theory
* showed confusion between what random and systematic errors are and did not link these to their effect on the data
* 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 or misunderstood the purpose of their investigation
* misused terminology when evaluating their method (i.e. random, systematic, precision, reliability, validity, and accuracy).