VCE Systems Engineering   
(2019–2025)

School-based Assessment Report

GENERAL OBSERVATIONS

This report provides advice for the first year of implementation of the [*VCE Systems Engineering Study Design 2019–2025*](https://www.vcaa.vic.edu.au/Documents/vce/systemeng/2019SystemsEngineeringSD.pdf). The [VCE Systems Engineering *Advice for teachers*](https://www.vcaa.vic.edu.au/curriculum/vce/vce-study-designs/systemsengineering/advice-for-teachers/Pages/Index.aspx) provides teaching and learning advice for Units 1 to 4 and assessment advice for school-based assessment in Units 3 and 4. Other support materials for the study can be found on the [VCE Systems Engineering study webpage](https://www.vcaa.vic.edu.au/curriculum/vce/vce-study-designs/systemsengineering/Pages/Index.aspx) on the VCAA website.

This report is based on the findings from the 2019 School-based Assessment Audit for Units 3 and 4 Systems Engineering. Schools providing the VCE must deliver the course to the standards established by the VCAA, ensure the integrity of student assessments and ensure compliance with the requirements of the VCAA for the relevant assessment program. For school-based assessment, the standards and requirements are stated in the assessment specifications set out in the relevant VCE study design and the [VCE assessment principles](https://www.vcaa.vic.edu.au/Documents/vce/VCE_assessment_principles.docx). The School-based Assessment Audit checks that the standards and requirements set out in study designs are being followed and that assessment is being carried out in line with the VCE assessment principles.

In general, schools developed School-assessed Coursework (SAC) tasks that required students to conduct research. A range of task types and contexts were generally evident. For example, SAC tasks that were designed around a scenario/case study showed evidence of personalised content and encouraged equity. Such contexts can provide stimulus material that may evoke a range of valid responses.

It was evident from the audit that many schools are not using tasks that are capable of assessing an array of key knowledge and key skills from the reaccredited study design. In particular, there was a lack of consideration of content related to the cradle-to-cradle analysis in Unit 3 Outcome 2 SAC tasks.

A positive finding of the audit was that the use of commercially produced materials was limited. Commercially produced assessment materials can often be restrictive when determining student achievement as they are not designed for the specific student cohort nor school context. These materials are also available in the public domain. Schools are therefore reminded that if they choose to use commercially produced materials, they must be sufficiently modified to be unique to the school to ensure student work can be authenticated.

Schools are also reminded to engage with all aspects of the study design when designing the stimulus material for SAC tasks, the SAC tasks themselves, and the assessment rubrics that guide the determination of students’ levels of achievement.

In addition, schools are encouraged to establish processes for cross-marking and moderation of student work. For schools where there is only one teacher of VCE Systems Engineering, cross-marking and moderation can take place with teachers of similar disciplines within the school, or partnerships may be formed with Systems Engineering teachers from other schools. Schools are encouraged to use the VCAA support materials and resources, and participate in professional learning opportunities for VCE Systems Engineering.

Schools also tended to refer to the *Administrative information for school-based assessment – Systems Engineering* documentation when referring to the School-assessed Task (SAT) and were able to identify the mandated criteria for assessment. However, often this information was not used to develop student-specific materials. Schools are reminded that content in the *Administrative information for school-based assessment – Systems Engineering* documentation is written for teachers and should be adapted to develop ‘student-friendly’ resource materials.

SPECIFIC INFORMATION

Unit 3: Integrated and controlled systems

Outcome 1

Investigate, analyse and apply concepts and principles, and use components to design, plan and commence production of an integrated and controlled mechanical and electrotechnological system using the systems engineering process.

School-assessed Task

*A record of investigation, design, planning and production.*

*AND*

*Preliminary production work to create a mechanical and electrotechnological integrated and controlled system.*

For the first time, there was a mandate on reporting levels of achievement for all students of VCE Systems Engineering for criteria one through three, inclusive, mid-year. Preparations and notifications to students by each school regarding this obligation were evident.

An important part of the process at this stage is the research, design brief statement and response, development of design options, modelling, and the development of assessment criteria. The research and design brief aspects were apparent through the audit process. However, the development of evaluation criteria needs work to move beyond only requiring students to demonstrate qualitative measures of the system.

Content relating to the presentation of design options that are meaningful and feasible and their effective modelling require more attention in teaching and learning programs.

The systems that were presented as suitable for demonstrating achievement against the mandated VCE Systems Engineering School-assessed Task criteria were not always congruent with the indicators presented in the criteria. Of concern were projects that were purely electronic, with no mechanical aspect; projects that were vehicle-based with no integration of electronic and mechanical subsystems; projects that were of kit form or taken from the internet with no modification; and projects with no capacity to measure some aspect of its performance and respond to it using feedback. These projects do not provide students with the opportunity to perform at the highest level across all of the mandated criteria. The projects must have the ability to allow students to respond to all indicators in the mandated VCE Systems Engineering School-assessed Task criteria for assessment to be valid. For criteria one through three, there needs to be opportunity for students to demonstrate scope for design, planning and modelling.

Teaching and learning activities must be broadened to address concerns for the design, planning and modelling potential of prospective projects. This should include explicit teaching and a formative audit process, conducted together with the students, to determine project congruence with the criteria and subsequent indicators for the SAT.

Assessment

The mandated 2019 VCE Systems Engineering Assessment Criteria were correctly identified by schools as the appropriate instrument to report achievement. The mandated Authentication sheet and Additional comment sheet were generally used by schools. However, it is recommended that moderation of student work is undertaken, either by colleagues at the same school or between teachers from neighbouring schools.

Outcome 2

Discuss the advantages and disadvantages of renewable and non-renewable energy sources, and analyse and evaluate the technology used to harness, generate and store non-renewable and renewable energy.

Task type option/s

Any one or a combination of:

* a short written report in the form of a media analysis or a case study or based on structured questions
* a multimedia/simulation presentation or report
* an oral presentation.

A broad range of renewable and non-renewable energy sources were considered in SAC tasks. SAC tasks that required both conceptual and technical understandings provided opportunities for students to perform at the highest level. In general, these SAC tasks used questions to elicit open-ended responses to the stimulus materials rather than closed ones, enabling students to demonstrate the key skills as listed in the study design. For example, task types that centred on a concrete scenario or case study provided opportunities for the students to research and question an actual working system in a real environmental and societal context, with rich opportunities to investigate deeply and display higher order skills.

The description and discussion of the advantages and disadvantages of non-renewable and renewable energy sources were also covered well, as were the evaluations of the technology and processes.

However, the concepts of cradle-to-cradle analysis, recent technological developments, the efficiency of energy conversions throughout the production process and technological developments were not covered comprehensively in the SAC tasks.

Assessment

Not all teacher-developed assessment criteria were congruent with the requirements of the study design, particularly with respect to content related to cradle-to-cradle analysis.

The weightings were appropriately set to reward a broad range of responses.

It is recommended that moderation practices be improved. Partnerships between teachers within schools and with other schools to cross-mark are encouraged.

The VCAA ran a series of moderation workshops in 2019 to assist teachers with cross-marking, and teachers of VCE Systems Engineering are encouraged to register for these and other VCAA professional learning opportunities in future.

Unit 4: Systems control

Outcome 1

Finalise production, test and diagnose a mechanical and electrotechnological integrated and controlled system using the systems engineering process, and manage, document and evaluate the system and the process, as well as their use of it.

School-assessed Task

*Completion of production work accompanied by a record of progress and modifications (images and text material).*

*AND*

*A record of diagnostic testing and performance data.*

*AND*

*A report that evaluates and suggests improvements to the system with reference to the factors that influenced its creation and to the student’s use of the systems engineering process.*

Consistent, regular and multimedia recording of progress were the most common approaches that schools reported using. These provided opportunities for students to be able to demonstrate detailed evidence of achievement against the indicators for both criteria seven and eight.

There was evidence that diagnostic testing was being performed earlier in the development of the individual student projects and was a continuous activity through the life of the project. This allowed for a deeper, more comprehensive response to the indicators for criteria six.

The explicit use of the systems engineering process needs renewed focus in the SAT. The systems engineering process informs the entire study and is referenced throughout the VCE Systems Engineering School-assessed Task criteria and subsequently the indicators.

There is evidence of increased awareness of the benefits of ePortfolios or digital forms of delivery as a record of evidence for the demonstration of achievement of the task.

Again, systems that were presented as suitable for demonstrating achievement against the mandated VCE Systems Engineering School-assessed Task criteria were not always congruent with the indicators presented in the criteria.

As mentioned, of particular concern were projects that were purely electronic, with no mechanical aspect; projects that were vehicle-based with no integration of electronic and mechanical subsystems; projects that were of kit form or taken from the internet with no modification; and projects with no capacity to measure some aspect of its performance and respond to it using feedback. Students are not able to respond to all criteria in the mandated VCE Systems Engineering School-assessed Task criteria if the project designed in Unit 3 is not suitable, and as the SAT goes over Units 3 and 4, both units are affected where this is the case.

Teaching and learning activities must be broadened to address concerns for the diagnostic testing, modification and replanning of the projects. This should include explicit teaching and a formative audit process, conducted together with the students, to determine project congruence with the VCE Systems Engineering School-assessed Task criteria.

Assessment

The mandated 2019 VCE Systems Engineering Assessment Criteria were correctly identified by respondents as the appropriate instrument to report achievement.

The mandated Authentication sheet and Additional comment sheet were generally used by schools.

As mentioned, moderation practices are also encouraged.

Outcome 2

Evaluate a range of new or emerging systems engineering technologies and analyse the likely impacts of a selected technology.

Task type option/s

*Any one or a combination of:*

* *a written report in the form of a case study or a media analysis or based on structured questions*
* *a multimedia/simulation presentation or report*
* *an oral presentation.*

A broad range of new and emerging technologies were considered for the SAC tasks, with an emphasis more so on new technologies than on emerging technologies.

A consideration of emerging technologies would allow for a more contemporary response when explaining the drivers of the development of technologies.

In general, any tasks that used structured questions designed such questions to elicit open responses to the stimulus materials rather that closed ones.

Research and evaluation of new and emerging developments in systems engineering products was addressed well in the stimulus material. This did not extend to systems engineering processes. This is an opportunity for improvement in teaching and learning programs.

The analysis of the impacts and potential of new and emerging technologies stimulus materials will need more scaffolding in order to elicit more compelling responses from students.

Assessment

Not all teacher-developed assessment criteria were congruent with the current *Advice for teachers*, particularly with respect to cradle-to-cradle analysis. However, the weightings were appropriately set to reward a broad range of responses.

As previously mentioned, moderation practices should be improved.