

Practical Investigations under lock down

Many teachers plan to do the Unit 2 and Unit 4 Practical Investigation towards the end of Term 3 for Unit 4 and in Term 4 for Unit 2.

The current lock down has upset Unit 4 course plans. In the last few days, VCAA and Vicphysics have been exploring some options for teachers. The state government has also announced an exemption to remote learning rules for school-based assessments that cannot be done online; this includes VCE Physics.

Note: The study design hasn't been changed for the remainder of this year, so primary data should still be used for both Unit 2 and 4 investigations and two independent variables need to be investigated for the Unit 4 investigation.

The VCAA has confirmed that generation of primary data as part of the SAC task can be managed using a number of strategies, including:

1. Teacher video
2. Using a simulation
3. Using a previously unassessed practical investigation from earlier in the year
4. Plan remotely, but conduct investigation back at school in Term 4
5. Use and adapt Vicphysics videos of investigations prepared for 2020 Physics Course
6. Conduct the equipment-based section of the investigation over a day in the September holidays

There is also flexibility in how the scientific poster can be managed.

Some resources are also listed.

Strategy 1 Use a teacher video

- Teacher demonstration via video link to students – may be 'real time' or may be pre-recorded.
- Teacher is videoed performing an experiment that generates primary data.
- Video zooms on measuring equipment (e.g. thermometer; voltmeter etc) so that students can record measurements of the experiment. Results should be recorded in logbooks and forms part of 'normal' teaching and learning (this assesses students' capacity to obtain primary data on which to base assessment)
- Teacher organises assessment task (part 1 of task) – a set of structured questions or general open question requiring students to analyse/graph data...etc (similar to usual data analysis type questions in SAC tasks) – approximately half hour task (assesses analysis of primary data). Teachers should consider authentication: students may plot their own data if authentication is not an issue, or the teacher may collect and allocate students different data sets, or student data could be collated and presented as a single data set for analysis.
- Teacher delivers part 2 of the task to assess the experimental design component of the outcome – SAC task could ask students how they would modify the original experiment to, for example:
 - improve quality of data
 - improve technique
 - extend the original investigation by testing a different variable or hypothesis (this therefore assess students' ability to design an experiment)
- Students write up a poster or mini-poster based on initial data/collated data, including information about their proposed modification/extension.

Strategy 2 Use a simulation program

- Access a simulation that students can use from home to generate data. (If teachers cannot access/provide a simulation, then organise a relatively simple task that students could complete using

equipment available in the home). This activity will form part of students' 'normal' class learning/understanding concepts and development of skills.

- Students submit their results to the teacher who then collates data into a single class data set (for physics, since two independent continuous variables are required, students could be organised into groups so that two different variables are investigated).
- For the assessment task, give students access to a class data set (for physics – the data can relate to their own investigated variable, or to the other one). Set up a half-hour assessment task where students analyse the data by drawing graphs (including error/uncertainty bars for physics) and drawing conclusions.
- Assess students' capacity to design an experiment after they have completed above SAC task (for physics, teachers may allocate either the independent variable that students did not investigate as a basis for the SAC task, or students may be required to outline a method by which their own variable could be investigated in class using an improved method and/or as an extension (coupled experiment). Students could also evaluate the 'home method' investigation task and explain how it could be improved to assess their capacity to design an experiment.
- A poster or mini-poster could be produced based on any of the data/investigations.

Strategy 3 Use previously generated primary data

Students may use already generated primary data from a practical investigation they have already conducted this year but have not used for another assessment task as the basis for further analysis/extension as described above. Ideally, students should be given other students' de-identified primary data as the basis of analysis, or may be given a task where they compare their own prior results (from their logbooks) with an unfamiliar data set (real or constructed) provided by the teacher.

Strategy 4 Combine remote and on-site assessment

- Students may undertake the 'planning' aspect of an investigation whereby teachers assess the student's capacity to design a practical investigation remotely (part 1 of the assessment task which should take no longer than 25 minutes). When students return to school, they may complete the data generation, analysis and poster completion aspects of the task (part 2 of the assessment).
- Students and teachers returning to school should operate under government COVID-safe requirements – refer to <https://www.coronavirus.vic.gov.au/coronavirus-covidsafe-settings> for further information.

Strategy 5 Use Vicphysics video resources

Use video resources from 2020 prepared by Vicphysics Teachers' Network

Last year with the early onset of COVID, VCE study designs including content and assessment were changed for 2020 only, including allowing the use of secondary data and reducing to one independent variable.

To assist teachers with managing the practical investigation, Vicphysics recorded videos of experiments of several topics. Students were able to analyse the videos, extract and analyse data. While the students did not design the investigation, nor set up the equipment, they nevertheless needed to decide how to take measurements, e.g., use stop frame or tracker, record the data and estimate uncertainties. So, the data could be considered primary data, but it was for one independent variable.

Fortunately, some of the topics were related so a second independent variable, or at least a parallel investigation, is feasible.

Alternatively, teachers could supplement the materials with a set of data related to a relevant second independent, continuous variable. Students may then compare data for analysis.

As is currently the case, the scientific poster may be based on one continuous independent variable and so the student generated data from the video can be used for this purpose. The study design states that the

poster should not exceed 1000 words, so teachers have the flexibility to put further constraints on the word limit and use student logbooks to assess some components of the investigation.

The topics with videos are:

- Saxon Bowl
- Sets of washers rebound off a spring
- Sets of washers bouncing on a spring
- Electrostatic attraction between a charged rod and a metal sheet
- Magnetic repulsion between two bar magnets
- Magnet repulsion between two disc magnets

There are general notes for the teachers as well as notes for each topic.

The videos are on the Vicphysics Google Drive, so the videos are not automatically open to all. Teachers need to request access by emailing Vicphysics (vicphys@vicphysics.org) and they will be given viewer status and be able to download the files.

Strategy 6 Use September holidays to complete task

Conducting much of the equipment-based section of the investigation at school in one day during the September holidays

If the school and the teacher are comfortable with the students coming in for a day, much of the experimental aspects can be done in one day. This has been a strategy used in pre-COVID days by some schools. Students and teachers returning to school should operate under government COVID-safe requirements – refer to <https://www.coronavirus.vic.gov.au/coronavirus-covidsafe-settings> for further information.

However much planning needs to be done by teacher and students to ensure the day is fully productive.

- The students' topics need to be approved well in advance, at least two weeks before.
- The students' plans need to be completed, checked and approved at least a week before. The plans should include:
 - Variables,
 - Equipment and measuring instruments
 - Experimental setup,
 - Sample calculations
 - Experimental procedure, including number of trials and initial data ranges for the independent variables
- Logbook and spreadsheet should be set up for data entry and the generation of graphs at least the day before. These should be tested beforehand with dummy data. Students should be able take a measurement, enter the data into the spreadsheet and graphs should automatically be updated.
- On the day, all the requested equipment should be available in the lab.
- Students should be encouraged to pause every 30 minutes or so, to look at their data and graphs to determine trends, identify measurements that should be redone, and other data values that should be explored more closely or beyond the initial range.

Poster

- Since the study design says 'not exceeding 1,000 words', teachers can determine their own word limit, as long as all students have same word limit to be fair.
- The poster is not an afterthought. It is more efficient if the construction of the poster goes hand in hand and runs parallel to the investigation.
- Use a PowerPoint template with boxes for each section. Give a copy to the students right at the beginning even before topics are decided and explain how it is to be used.
- The student enters content into each box as it is done:
 - After topics are approved – Enter the title.

- After plan is approved – Enter aim, variables, equipment, set up, method, etc.
- As measurement begins – Enter a table of data, a graph, a photo of the equipment, do a sample calculation with uncertainties.
- As measurement continues - Enter comments in the discussion on problems, findings, etc
- On completion of analysis – Enter conclusion, tidy up, check for consistency and completeness.

This process should minimise the pressure of the task and keep the students focussed.

Resources

Teachers:

- VCAA: Further advice regarding authenticating assessments remotely is available at <https://www.vcaa.vic.edu.au/news-and-events/latest-news/Novel%20coronavirus%20update/Pages/SchoolsandEducators.aspx> Teachers can contact Maria James, the Science Manager at VCAA if they wish to discuss suggestions further
- Vicphysics: Subscribers can access the pages ‘Investigations and Practical Activities’ [Investigations and Practical Activities - Vicphysics Teachers' Network Inc.](#) and ‘Online Teaching and Learning’ [Online Teaching and Learning - Vicphysics Teachers' Network Inc.](#). The latter webpage was prepared last year and has information on conducting practical investigations at home, including phone apps for data collection.

Students:

- Vicphysics: Students can access the ‘Practical Investigations’ webpage, [Practical Investigations - Vicphysics Teachers' Network Inc.](#) which has topic lists, advice on logbooks, data analysis resources and poster templates with examples and advice.