

Meeting with teachers, Victoria - Physics
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Background

Victoria has a high retention rate to Year 12. This combined with limited tertiary places creates intense pressure on students to obtain a very good ATAR.

In Victoria, the ATAR depends on subject study scores produced by VCAA, which are standardised to produce an ATAR.

The subject study scores are largely determined by exam results. For the sciences the external assessment is currently weighted at 60%, with internal assessment 40%. The internal assessments are statistically moderated against the exam. Consequently teachers select their assessment tasks and implement them in a way such that they have minimal impact on the task of maximising the students' exam results.

Question 1

The Victorian physics course has a long and generally rewarding history with extended tasks. An extended experimental investigation has been part of the physics course since the 1980's. In that time the nature of the task, the mode of assessment and the implementation in the classroom has gone through many ups and downs. So there is considerable experience to draw on.

- a) Such investigations involve a different dynamic in the classroom. The teacher's role is different. No longer the fount of all wisdom, now the teacher is a consultant, advisor, even a collaborator at times. It is a most rewarding experience for both teacher and student. The exercise is one students and teachers fondly remember many years later.

So during the investigation itself the teacher is less pressured, there is usually less formal lesson planning to do and less day to day homework correction, etc. However more thought and time needs to be put into the design of the task and documentation to guide the students. But once done, the material can be used with minor refinement the following year. The assessment of the students' completed work can be burdensome, particularly for a large class. Fortunately it is possible to devise strategies to more effectively manage the class time and streamline the assessment task.

This also applies to the impact on students. The strategies that can ease the workload on the teacher, can also substantially reduce the pressure on students.

- b) Extended tasks are the only means in which students engage in the independence of planning a task and learn of the benefit of organisation. The extended experimental investigation, in particular, is the only occasion in the course where students:
- plan their own experimental design,
 - select their own equipment,
 - decide on independent and dependent variables,
 - consider measuring instruments and desired accuracy,
 - analyse data to a depth and subtlety not possible in conventional practical activities.

For these reasons that activity is valued. However if the assessment process does not value either the task itself or the teacher's assessments of these aspects, then teachers will simplify the task, sometimes to a mere shadow of its former self.

- c) The activity is an excellent means of teaching about the nature of the scientific process because that is what the students are engaged at the time. Similarly the subtleties of uncertainties and error analysis as well as the use of data analysis tools are readily taken up.

Question 2

'The basics' and 'higher order skills' are not really discrete curriculum elements. There is more a continuum of content ranging from the easily accessible to the more subtle on one dimension and from the fundamental and essential to the peripheral on another dimension. The dichotomy between 'the basics' and 'higher order skills' is not only naive and seemingly populist, but ignores that fact in some instances the fundamental can be challenging, but once mastered further conceptual development can be straightforward.

Having said all that the terms 'the basics' and 'higher order skills' have not been commonly used in discussions of physics curriculum. The distinction does not apply. Nearly all of the content is at a level that does require some thought without being either excessively complex and overtly simple.

Question 3

The internal assessment criteria for assigning numbers for student work are quite well written. But their format could be improved to make them more user friendly.

For the external exam, there are no achievement standards as such. The grade cut-offs for a particular exam are determined largely by the perception of how difficult the exam was. This is done by the chief assessor, an experienced practising teacher, probably in consultation with VCAA personnel. The grades are initially of value to the student, but in terms of the exam's impact on students ATAR scores, it is their rank order within the cohort.

The exam results and the statistically moderated internal assessment are combined into a study score for each subject with a range of 0 to 50 and a mean of 30 and a specified standard deviation. These study scores generate the ATAR, but first they are partially standardised to allow for differences in the student populations doing different subjects. This means the study scores of each subject are scaled up or down for a few points.

Question 4

The VCE is not a standards-based system, it is norm referenced. Exam letter grades are determined by a percentage of the student cohort.

For internal assessment, descriptive criteria are used to assign numbers to student work, but these numbers are then statistically moderated against the exam. So the criteria are, for all intents and purposes, ignored or at least downgraded.

Question 5

- a) Our physics exam is a reasonably effective tool at measuring conceptual understanding. There are hardly any 'recall' questions at all. Many of the questions assess a high level of analytical skill and several questions assess a full conceptual understanding via written answers to questions. However the exam does not assess the practical skills of experimental design and data analysis.

Consequently the impact of the exam on teaching and learning is to emphasise the former and de-emphasise the latter. The minimum amount of practical activities is usually done and probably in a perfunctory manner.

- b) As far as it goes, the exam is a valid and reliable means of what it is designed to assess. However it is not a valid measure of the course as a whole.
- c) Until this year Physics had two 90 minute exams, one in June and one in November. That had been beneficial for teacher and student alike in giving i) an early focus to the year, ii) early feedback before the November exam and iii) reduced tension at the peak exam time in November. From this year, there will be one 150 minute exam with 15 minutes reading time. The exam will cover five discrete topics with a large number of discrete questions to answer in that time. It will be interesting to see how the students respond and whether the exam format will have a negative impact on student enrolments.