

Rethinking practical assessment in first year Biology

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Introduction

Practical work is viewed as an essential component of studying the natural sciences. The “hands on” approach has the potential to stimulate student interest in the subject matter, teach laboratory skills, enhance the learning of knowledge, give insight into the scientific method and develop scientific attitudes such as objectivity (Gorst and Lee 2005). Practical work gives students the opportunity to learn and practice all the activities involved in working in their profession (Meester and Maskill 1995). Practical classes in the First Year Biology unit Animal Diversity, Ecology and Behaviour offer students an opportunity to handle preserved specimens of animals and to see external and internal structures of animals firsthand. The practical exercises allow students to review the lecture content and to fully understand the function of the various structures. Students are arranged in benches (small groups) which gives them the opportunity to discuss the concepts together. Teaching staff are available to identify structures and help students interpret what they see in terms of function. The practical classes are regarded by many students as the highlight of the unit.

A decline in marks and pass rates in recent years has prompted this review. The average final mark for the unit has declined by 10% and overall pass rate has decreased by 23%. Students are performing particularly poorly on the practical examination, with only 30% of the class passing the examination in 2005. Possible reasons for the decline may include a change in academic ability of students, fewer students studying Biology in Year 11 & 12, a lack of aims and objectives stated for the practical course and problems with assessment. The aim of this project was to explore these themes, evaluate the current assessment scheme of the practical course and make recommendations that will improve student learning outcomes.

Methodology

Student ENTER score data (university entrance ranking) for the years 2001-2006 were sourced from the Management Information Unit, La Trobe University. A Student Evaluation of Teaching (SET) questionnaire was constructed to survey biological background of students and student perceptions of practical class format, clarity of aims and assessment. The survey was administered during one of the practical classes in May 2006 to optimize the number of responses and was answered by 70% of the class.

Results and discussion

Since 2003, class size has increased by approximately 50 students and the class has relatively greater representation of students with lower ENTER scores. Students still have a good background in Biology, with 70% of the 2006 class studying Biology at a Year 12 level.

In general, a majority of students thought that they had a clear idea of what was expected of them and that the assessment requirements were clear. Most students thought that the aims of the practical classes were clear even though they were not stated anywhere in the laboratory manual. Students were unsure of the relevance of the unit to their careers and many were overwhelmed by the amount of material to be learned. The practical course would benefit from a clear statement of overall aims and objectives, and specific learning outcomes for each practical class. A statement of aims and objectives gives clear directions to students and structures the process of learning (Meester and

Maskill 1995). Practical work gives students the opportunity to learn and practice skills necessary for working in their profession (Meester and Maskill 1995). A statement of learning outcomes could also highlight the relevance of these skills to the profession.

A majority of students thought that there was too much emphasis on examinations and memorization of facts in this unit. It is well known that unseen examinations are considered to be a poor measure of learning because the result may reflect whether a student is good at passing examinations, whether they were influenced by illness on the day or have a tendency to panic under examination situations, rather than just their knowledge and understanding of the subject matter (Sambell, McDowell and Brown 1997). Overloading students with content without giving them a framework of objectives or learning outcomes can overwhelm students and may lead to unsatisfactory methods of study like memorisation.

Students performed particularly poorly on the practical examination. The practical examination traditionally assesses how much the students have learned in the practical classes in terms of practical skills and knowledge of whole animal and prepared slide material. An end of course practical examination may not provide students with the best opportunity to demonstrate the skills they have developed during the course (Bennett and Kennedy 2001). In the first section of the exam, students are required to dissect an animal, draw the dissection and label key structures, all in a ½ hour time frame. The same tasks are completed during the practical classes in 1-1 ½ hours. Marks are awarded for dissection, drawing and correct labels. The time constraint of a practical examination is a significant cause of anxiety. Students are not just being assessed on what they know and how good their practical skills are, they are also being assessed on how well they work under pressure. Gorst and Lee (2005) argue that the learning experience of “working under pressure” should not be introduced at the time of the examination. The practical examination also duplicates the assessment of laboratory skills such as dissection and drawing. The best dissections are often done when a student works carefully and precisely. Kirschner and Meester (1988) argue that if a goal of the course is to assess acquisition of skills, then penalisation for mistakes does not advance the learning of those skills.

Assessment which is perceived as threatening and which provokes anxiety may encourage students to take a surface learning approach (Gibbs 1992). The practical examination would fall under this category of “threatening and anxiety-provoking” and we know that a large proportion of students think memorisation is the appropriate method of study for this unit. If we reduce the emphasis on formal examinations (no practical examination) and increase the value of ongoing practical assessment (dissections, drawings and scientific reports), we may achieve better outcomes for the students in terms of what they learn and how they study in First Year Biology.

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