

The role of casual academic tutors in educating the next generation of scientists (0166)

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Background

In a world where knowledge and understanding is constantly changing, the ability to critically analyse new information is an essential skill for all students (North, 2005, Byrne and Johnstone, 1987). Undergraduate students enrolled in a science program graduate into a variety of roles, including postgraduate student, researcher and professional in a non-science related field. Regardless of their preferred path, a concerning number of undergraduate science students are completing their degree without the critical reasoning skills necessary to succeed as professionals in their chosen career (DeHaan, 2005).

While lectures are designed to provide students with a basic theoretical understanding, science practical classes are designed to supplement lecture material, provide students with hands-on experience in an authentic scientific environment and encourage students to think critically about scientific principles (Russell and Weaver, 2008, Burke da Silva et al., 2008). Traditionally, practical classes have adopted a structured, recipe-based approach, where students are provided with a list of materials, methods and questions to complete within the class time. This approach has been found to be neither authentic nor conducive to developing critical reasoning skills (DeHaan, 2005). Progressively, these traditional classes are shifting to a student-driven inquiry-based approach, where students are provided with a small amount of background information and encouraged to develop and answer their own research questions (DeHaan, 2005, Russell and Weaver, 2008). While these research questions are often simplistic, they do provide students with an authentic experience of research within the limits of their existing scientific knowledge (Brickman et al., 2009).

While fulltime academic staff members are generally responsible for planning and implementing course curricula, face-to-face teaching is often carried out by casual academic tutors. A recent audit of Australian universities estimated that approximately 15% of university teaching staff in Australia are tutors, and that tutors perform up to 50% of the full time teaching load (Department of Education, 2005, 2007, Percy et al., 2008). Tutors are predominantly final year undergraduate students or postgraduate students enrolled in honours, masters, medical or doctorate degrees (Percy et al., 2008) and often have little to no experience of inquiry-based classes from a students' point of view, and little to no formal training in effective teaching techniques. Regardless, postgraduate students are particularly well suited to mentoring students in inquiry-based classes as they provide undergraduate

students with the opportunity to learn about authentic science related careers from a recent graduates' point of view.

Methodology

This study investigated how a range of scientific practical classes prepare undergraduate students for a world where they need to critically assess all new information. Specifically, we identified the roles of tutors in a range of classroom settings. The Approaches to Teaching Inventory (ATI) developed by Trigwell & Prosser (2004) was used to identify how students (n=13), tutors (n=49) and full-time academic staff members (n=5) felt tutors should approach their classes, and the teaching practices that were most and least valued by each group. Initially, responses were divided into student- and teacher-focussed approaches to teaching and the mean responses from each participant group calculated. The mean responses for each item on the ATI were then calculated for each group, to investigate whether there was a specific preference for or against any particular item. A one-way ANOVA with Tukey's post-test was carried out to determine the differences between the approaches to teaching and whether any group showed a preference for either approach or a particular item.

Following on from the survey, separate focus group interviews were conducted with students, tutors and academics to obtain a greater understanding of the classes investigated. Specifically, the interviews investigated three specific research questions:

1. The primary roles of tutors in practical classes
2. The teaching practices tutors employ to accomplish the learning objectives of the class
3. The personality traits needed to accomplish the learning objectives of the class

All interviews used a consistent semi-structured schedule with open ended questions and follow-up probes. The interviews were audio recorded, transcribed, and then analysed using the Nvivo software package. In the first stage of analysis, the main themes identified in response to each question were coded and then compared across interviews in the second stage.

Findings

All groups were familiar with the concepts of recipe and inquiry-based curricula, though some students and tutors were not familiar with the actual terms. The tutors reported that they were significantly more likely to adopt a student-focussed approach to their teaching. In contrast, students felt that their tutors adopted a balanced approach, which was neither student-focussed nor teacher-focussed. Within the sample investigated, individual academics showed clear differences in their approaches to teaching. Two were clearly student-focussed, while three reported adopting a balanced approach to teaching inquiry-based classes. Interestingly, analysis of individual items on the ATI revealed that all groups

felt that the most commonly used teaching practice was engaging in conversation with students about the class. All groups also agreed that the least commonly used teaching practice was to focus on only providing students with information required to pass formal assessments. During the interviews, all groups independently agreed that one of the most important roles for tutors is to interact with the students. Specifically, tutors need to facilitate learning in inquiry-based practical classes by guiding students through the experiments, and asking and answering questions to motivate students to engage in the research experience. To do this, tutors need to be enthusiastic about science, friendly and approachable. One student stated: “knowledge can be gained from a textbook, but the role of the tutor is to engage the class and answer questions”.

Conclusion and Future Directions

Analysis is currently underway to determine how these perceptions compare to actual classroom practices which have been video recorded. Our findings so far suggest that in inquiry-based classes designed to prepare students for a world where knowledge is always changing and critical analysis skills are essential, the most important role for tutors is providing a welcoming and friendly learning environment that engages students in the research process.

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