Case Study: Skills development through authentic assessment

Background

"Authentic assessment" is relevant to real world outcomes and engaging for students (Ashford-Rowe et al, 2013):

- Challenging, relying on tasks which establish connections between real-world experiences and academic ideas.
- Conducted in a 'real world' environment rather than a hushed exam room.
- Outcomes should be in the form of a performance or product.
- Should teach the value of collaboration.

"Authentic assessments ask students to analyze, synthesize and apply what they have learned in a substantial manner, and students create new meaning in the process." (*http://jfmueller.faculty.noctrl.edu/toolbox/whatisit.htm*)

Given the lack of student engagement with anything that smacks of "skills" rather than "facts" in science, the overuse of essays for assessment of competencies is a frequent problem. Rather than using essays to construct artful and original arguments (because they may be penalized by the marking scheme for doing that), students imitate what they have read elsewhere, submitting strings of loosely connected "facts" without significant argument, viewpoint, or synthesis (Robertson, 2013). This is a long way from the top end of Bloom's taxonomy of learning objectives (Bloom et al, 1956). And this treadmill activity has little to do with what goes on in the workplace.

Figure 1: Bloom's Taxonomy of Educational Objectives.

Reasons for introducing this teaching method

It is often argued that skills development should take place as part of academic courses, but concentration on facts in core modules means that skills development is frequently squeezed to the margins of the curriculum. Faced with the task of developing a research skills module for nearly 300 biological sciences students, I was determined to apply the

principles of authentic assessment described above. The practical problems in achieving this with a large number of students chiefly involve the staffing demands of this approach. There are considerable problems with applying performance-based outcomes to large groups of students (Altintas et al, 2014).

Team-based learning captured my attention several years ago, having increased in prominence in medical education in particular. The evidence is growing that team-based learning enhances student engagement (a frequent problem with "skills" modules) and may be the best practical answer to my colleague Chris Willmott's identification of *"group work as opposed to team work"* as a significant problem - a group being a collection of variably engaged individuals acting for their own benefit whereas true team work involves goals that individuals cannot achieve on their own. Team-based learning represents a shift from a teacher-based strategy to a student-centred approach and requires a realignment from traditional delivery methods (Simonson, 2014):

- The goal shifts from knowing content to applying concepts.
- The instructor shifts from delivering information to creating opportunities that will engage students in learning.
- Students shift from passive to active participants.
- The responsibility for learning shifts from the instructor to the student.

Lecturer's perspective

In setting up this new module I deliberately set students at the beginning of their second year a challenging task which they could not reasonably be expected to achieve in isolation, reinforcing the concept of "team work not group work". This is reflected in the Intended Learning Outcomes:

- Plan and implement a specific research question.
- Search for information effectively using online databases.
- Demonstrate an understanding of the ethical implications and associated legal requirements of biological research.
- Critically evaluate research literature.
- Interpret and present experimental data in writing and using oral and poster presentations.

To achieve this, students worked in teams of five to produce a 5,500 word research proposal designed to answer a current biomedical problem of their choosing, based on a broad "seed topic" such as antibiotics, diabetes or epigenetics. The task starts with a literature review, supported by a lecture and online assessment involving literature searching and citation data. This is followed by lectures and assessments on experimental design and bioethics. In parallel weekly tutorial sessions teams work with module tutors to develop and write their research proposals. The proposals were assessed using peer weighted marking in which the tutor mark is moderated by anonymous team peer marking. The final element of the module was the submission of an individual poster describing the research proposal which was examined via a short oral presentation.

Figure 2: Weekly team-based learning sessions

Students' perspective

As anticipated and desired, students found the module challenging. From student feedback via weekly conversations, emails and an anonymous questionnaire, this challenge included the idea and logistics of working as a team as well as the science:

- *Students who are better at skills associated with this project are unfairly brought down by students who may be less skilful because they don't want to be seen as "taking over" and doing the whole project. My degree is my own, why should a module be dependent on four other people?*
- *It's a good way to meet other people on the course, but it's hard to meet up because people have different societies and work schedules.*
- *The peer weighting definitely has the potential to have an element of a 'popularity contest'.*
- *While it was enjoyable to read more than I care to recall on a subject I'd previously never heard about, it's a very intensive module in which, for a large part, you don't feel like you're getting anywhere. I personally found that irritating as I have no intention of pursuing a research career and it's taken so much time away from making lecture notes and revision.*

However, most students also found the module highly engaging:

- *I am glad that we have this module. I feel that I can gain a lot from writing a research proposal, for example, it gives me the experience of planning and writing scientific*

material, which help boost my CV, and it forces me to read more research articles, which is beneficial to my study.

- *I think this module was useful and allowed us to learn and develop our skills (organisation, teamwork etc). The topics given were interesting and diverse for all the groups - and allowed us to have in depth knowledge of our allocated topic. I believe it has helped us to prepare for our research we will undertake in third year.*
- *It was good that we had deadlines for the draft versions of the sections, because it meant that the pace of the project kept going and everyone was made to actually work rather than leaving it to the last minute. Also, the feedback from our tutor was very useful.*
- *I loved the social and interpersonal side of this module. I met some new people, it was a great team-working and organisational opportunity. In fact, I'll miss the tri-weekly meetings.*

Issues

Delivering the module for this number of students was challenging because it was demanding on resources such as timetabling and room allocation. The demands on teaching staff were also high as this is an immersive and intensive form of interaction which is far more taxing than reciting PowerPoint slides in a lecture theatre. The team-based, peer-weighted approach was essential to a successful outcome in addition to the benefits to students in developing soft skills valuable in the workplace such as interpersonal negotiation. This was difficult for some students.

Benefits

The level of engagement with this skills development module was reflected in the outcomes attained, with a module median mark of 72%. 61% of students achieved a first class mark and only 1% failed the module, a considerable achievement for a cohort of 279 students. The quality of the work produced was such that we were able to obtain external funding to inaugurate a new academic prize, the School of Biological Sciences Prize for Creativity and Innovation. The contenders for this prize are:

- *Enhancing mitophagy as a novel therapeutic approach to tackle Parkinson's disease.*
- *The effects of supplementing vitamin D on reducing the effect of parathyroid hormone during pregnancy and the chance of developing type 2 diabetes mellitus.*
- *Does increasing the number of CpG motifs in a DNA vaccine enhance the immune response?*
- *Will using antiretroviral treatment prior to vaccine administration increase the effectiveness of the RV144 vaccine against HIV infection?*
- *Do ciprofloxacin and tylosin have a negative impact on the population size of microbial primary producers in freshwater river systems?*
- *Will human embryonic stem cells outperform induced pluripotent stem cells in the treatment of GABA-A psychiatric disorders?*

Reflections

In spite of the issues noted above, the efficiency gain from this pattern of delivery for this large cohort was considerable. The students themselves state that they feel better prepared for final year independent research projects and we are hopeful that these gains will translate into long term benefits at degree level and beyond.

Publications

I have a strong track record of publishing the outcomes of my education research in peer reviewed journals, online via my blog and at conferences (see Round 1 application). A manuscript describing the outcomes of this module is currently in preparation and I plan to present the results at several conferences later this year.

1,480 words

References

Altintas, L., et al. (2014) Modified use of team-based learning in an ophthalmology course for fifth-year medical students. Advances in Physiology Education, 38(1): 46-48.

Ashford-Rowe et al. (2013) Establishing the critical elements that determine authentic assessment. Assessment and Evaluation in Higher Education 39(2): 1-18.

Bloom, B.S., et al. (1956) Taxonomy of Educational Objectives – The Classification of Educational Goals – Handbook 1: Cognitive Domain. London, WI: Longmans, Green & Co.

Robertson, S.I. (2013) Academic essay writing as imitative problem solving: examples from distance learning. Assessment & Evaluation in Higher Education 39(3): 1-12.

Simonson, S.R. (2014) Making students do the thinking: team-based learning in a laboratory course. Advances in Physiology Education, 38(1): 49-55.