ENHANCING LEARNING, GENERIC SKILLS AND CAMARADERIE THROUGH STUDENT PRESENTATIONS

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Abstract

First year undergraduate science and environment students (110 in total) in the School of Biomolecular and Physical Sciences, Griffith University, undertook a course called Topics in Biosciences. This course was designed to inspire students about current bioscience issues. It aimed to enhance generic skills such as oral communication and team work, and to develop the students' capacity to find and use accurate scientific information. Each theme developed in the course had elements related to both health/disease and ecology, where understanding required information from both perspectives. The students undertook workshops in rooms with computers to allow internet access. The varied workshop topics had an Australian-context bias and matched the general lecture themes. After initial training workshops, the students began a series of workshop sessions where they were responsible as members of a small team for using internet resources to research and present a topic to the whole workshop group. The topics were chosen for their interest and multidisciplinarity. In spite of the initial fear of oral presentations, the final surveys showed an overwhelming positive response to this style of learning, with no adverse comments on this unfamiliar and challenging format. The student presentations and use of expert lecturers were singled out as the best features. The students also remarked that the format had broadened their interest in bioscience, helped them to meet other students, and commented that having to do their own research and talks was a great way to learn.

Keywords - student presentations, oral communication, collaborative learning, active learning, integrating disciplines, student-centred learning, PowerPoint presentations

1 INTRODUCTION

Most students use a range of information technology devices in everyday life but many courses at University do not take advantage of this increasing familiarity with technology and improved computer literacy. However, computers can be powerful communication tools and provide a way to access a vast array of data, images, sound and text. If information technology helps to develop in students their ability to find, analyse, synthesise and evaluate information then it becomes a highly effective learning tool. Its use can encourage students to engage more actively with their courses to achieve enhanced learning outcomes.

Some of the factors known to help people to learn include: tasks that prompt questions that are perceived as authentic and relevant to their goals, with new information presented in the context of these questions; learning that builds on and extends what they already know; chances to discuss, explain, write and reflect on new ideas they are learning; and being given tasks which give them some control over what they are learning [1].

In this paper we describe how we modified an existing course, offered to first year science and environment students, to include tasks that better fitted the above criteria. The format required the students to use computer databases to find information, interact with others to master the knowledge, work collaboratively in a small group to assemble that information and finally to present it to their larger workshop group.
1.1 Background to the course and the student cohort

Topics in Biosciences was originally conceived as a course for students enrolled in first year biomedical sciences that would excite and inform them about contemporary issues in biosciences. In 2009 there was a change in the student cohort when the course became core for students studying Ecology and Conservation Biology (34%) and Biomedical Science (46%). A further 20% of students were from science and environment majors who chose this as an elective course. The total enrolment was 110 students. This change stimulated a revision of both the course content and the style of presentation. A major challenge was to find topics that were contemporary, interesting and relevant for students with a diverse range of interests and particular focus. We also wanted the course to enhance generic skills, in particular oral communication, the capacity to find and use accurate scientific information, and team work, in which students from different disciplines worked together to answer questions that required multidisciplinary knowledge.

The students had varied educational backgrounds. Some mid-year entry students had done no Biology at University level, in contrast to those who had completed first semester courses in Human Biology and Cell Biology. International students in particular indicated a lack of familiarity with the use of some computer software, such as PowerPoint, and computer databases and other library resources.. This diversity of background was another challenge for the course design.

2 METHODOLOGY

The course was presented through a 2 hour lecture time slot each week, with associated 2 hour workshops. In these workshops, emphasis was placed on having the students find information using computers in the workshop rooms, rather than the more passive system previously employed.

2.1 Lectures

Initial lectures in the course gave the students general background information that would be needed throughout the semester. For example, the Science Librarian gave a comprehensive demonstration of use of the database Scopus which covers many journals of relevance to both biomedical and ecological topics. He employed examples of future topics from the course to illustrate how the students could find relevant information on that topic. He also demonstrated how to refine searches to target the information required. We took the approach that students would also commonly use Google and Wiki sites when searching, so the librarian included tips and examples of ways to make such searches meaningful. Scopus also has a useful bibliography-creation option which introduced the students to the correct ways to cite references and the use of a Scopus program to allow direct downloading. Since the students were to give oral presentations using PowerPoint, an interactive lecture was devoted to looking at good versus undesirable features of presentations in general. Finally, in the expectation that many of the topics to be covered would have social and ethical dimensions, two lectures on bioethics were part of this background training.

For the remainder of the lectures, the challenge of the student diversity was faced by choosing three overarching themes, each with elements related to both health/disease and ecology, where understanding required information from both perspectives. These themes were (i) utilisation and conservation of natural resources (ii) disease ecology and (iii) investigative techniques for bioresources. Presentation of this material was from both in-house and invited guest lecturers, known for their passion for their topics.

2.2 Workshops

The students undertook workshops in rooms with computers to allow internet access and use of library databases that permitted access to full journal articles. Each workshop group had 20-24 students from a mix of study programs. The varied workshop topics had an Australian-context bias and matched the overarching course themes. Initially, general workshops required students to work individually (with assistance from the tutor) on questions that required application of principles of scientific information retrieval, an understanding of bioethics, and the ability to use PowerPoint to make some short summary slides of a chosen topic. The experienced students completed this work quickly, freeing time for the tutor to concentrate on helping those with less experience in the use of computers for seeking information and preparing presentations. They were also able to help students understand unfamiliar biological terms and processes. Students also assisted each other during these sessions, by sharing useful web sites or demonstrating to others how to manipulate options in PowerPoint.
The students then began a series of workshop sessions where they were responsible, as members of a small team, for researching, then presenting material. The topics given to 4-5 teams/workshop groups were chosen for their interest and multidisciplinarity. Some examples of the topics chosen were use of frog “glue” in surgery; Komodo dragon conservation and disease issues related to pathogenic salivary bacteria and recently identified ancient venom; green fluorescent protein from jellyfish and use in “brainbows”; use of pollen in forensic science and in ecology; and Bluetongue Virus: disease and effects of climate change. To help the students organise and cover the topics appropriately we provided five separate questions on the topic, and gave a few web sites as good starting points (Table 1).

Table 1: a typical example of a workshop topic for the course, Topics in Biosciences. Students given different topics had to work as a team to find information on their topic using internet resources, then organise a team presentation, prepared in PowerPoint, to be given to the whole workshop group in the following week.

<table>
<thead>
<tr>
<th>Theme 1: Utilisation and Conservation of Natural Resources</th>
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</thead>
<tbody>
<tr>
<td>Group Topic: Frog “Glue”</td>
</tr>
<tr>
<td>Question 1</td>
</tr>
<tr>
<td>The Australian Holy Cross frog (<em>Notaden bennetti</em>) secretes a sticky substance from its back. This substance is useful to the frog and has recently been shown to be beneficial to humans.</td>
</tr>
<tr>
<td>a) Why is this sticky secretion useful to the frog?</td>
</tr>
<tr>
<td>b) What is the potential use of this substance in everyday life?</td>
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<tr>
<td>Question 2</td>
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<tr>
<td>Why is ‘frog glue’ of particular use in surgery?</td>
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<tr>
<td>Question 3</td>
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<tr>
<td>‘Frog glue’ sets in less than 60 seconds. How are the setting properties of the glue controlled during an operation where more time may be needed?</td>
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<tr>
<td>Question 4</td>
</tr>
<tr>
<td>‘Frog glue’ is a biological adhesive. Why is it favoured over biological adhesives obtained from blood products (e.g. fibrin, albumin)?</td>
</tr>
<tr>
<td>Question 5</td>
</tr>
<tr>
<td>Briefly describe a scientific experiment that has been carried out to test the value of ‘frog glue’ in surgery. Include information on the animal model used, the type of injury being repaired, and whether the ‘frog glue’ aided in repair.</td>
</tr>
</tbody>
</table>

Getting Started: Useful Websites and Databases
Scopus database
www.abc.net.au.catalyst

The course convenor allocated teams of 4-5 students per research topic, ensuring a mix of gender and student study programs. The students were required to give 3 presentations during the semester, with the team allocations changing each time. In the first 2 hour workshop for each of the three allocated topics the students met the team members, examined aspects of their research topic and agreed on subdivision of tasks. They then used the internet resources, under the general guidance of the tutor, to retrieve information, discuss it with their team members, and work towards producing a PowerPoint presentation (~15 minutes) for the following week. In the subsequent presentation workshop, there were four or five team presentations on the different topics, with each taking about 15 minutes and with 5 minutes for questions from the audience. All the PowerPoint presentations were uploaded to the course Blackboard web site to provide a revision resource and to allow teams from the different workshop groups to see how others had approached the same topics.
Could move this paragraph below to the ‘assessment’ section??

Each team presentation was worth 20%, with 15% being allocated by the workshop tutor, using marking guidelines that had been issued to the students, and 5% from peer assessment by members of each team

2.3 Assessment

Lecture attendance (judged by completion of short answer sheets during the lectures) was worth 20%, three presentations were worth a total of 60% and a final exam was worth 20%. The final exam questions were all short answers and based on lecture content and workshop topics. They emphasised application of knowledge where possible rather than rote learning. For example, a question related to bioethics was phrased as follows:

“Recently there has been a Senate inquiry into a Company that has patented a breast cancer gene, and is now attempting to block genetic testing for breast cancer. The patenting could preclude anyone else doing research on treatments related to that gene. How is this company’s attitude a contradiction of the four principles of Medical Bioethics?”

rather than asking for a simple listing of the four principles. The students were given 85 possible exam questions a fortnight ahead, and were told that the exam would include about 40 of these, from which they had to choose 20 to answer (5 each from 4 subsections of the paper).

2.4 Evaluating outcomes

The students were given surveys to be completed anonymously after the final exam. Some open questions sought ideas from the students on further suitable topics and asked them to highlight good and poor features of the course. Closed questions were designed using a 5-point Likert rating scale. These questions examined the students’ views on the relevance and interest of topics, changes in their confidence to give oral presentations, and various other outcomes of the course including whether the course facilitated the forming of new acquaintances, heightened their interest in science or revealed unexpected career pathways. The results were analysed using Mini-tab statistical software and employing tests suited to non-parametric data. The Wilcoxon single-sample signed rank test was used to compare the test median with the average median value on the 5 point Likert scale (median of 3). The Mann-Whitney test was used to compare two population medians (attitudes “before” the course started and “after” course completion).

3 RESULTS

The course aimed to develop the students’ capacity to give good oral presentations, an important generic skill. The student responses showed a noticeable improvement in confidence as a result of completing the Topics in Biosciences course (Fig. 1).

Fig. 1: An assessment of the students’ confidence in giving oral presentations before and after the course, Topics in Biosciences, which was undertaken by both biomedical and environmental science first year students at Griffith University. The scale was a 5 point Likert rating scale; statistical significance was judged using the Mann-Whitney test for non-parametric data. The confidence levels
after completing the course had a median value of 4, significantly higher than the median value before starting the course of 3 (p<0.0001). N=102

Responses to the questions below about other attributes of this course resulted in a median value of 4, significantly higher (p<0.0001) than the average median of 3 on the 5 point Likert scale (“disagree strongly” to “agree strongly”).

- The content of this course has increased and broadened my interest in science
- I found this course challenging but not excessively difficult
- The learning environment was supportive of diversity of abilities and interests
- We had opportunities to learn through discussion with one another and with the lecturer
- The way that the workshops were organised helped me to make new acquaintances

The value of the course organisation for helping students to make friends was also commented on in the answers to the open questions.

The students were asked whether they favoured the replacement of one of the oral presentations with a written report. Opinions were divided with 43 saying “no”, and 33 saying “yes”. However, the “no” responses were generally more vehement than the “yes” responses, with comments such as:

- No the presentations were the best part of this course; they allowed you to explore a topic in a non-stressful way, and as such allowed you to enjoy it. A written report would spoil this.
- NO – Presentations were an effective & enjoyable way to learn without so much pressure/stress. They greatly facilitated my learning and made this course very enjoyable and interesting. It made it different from other courses in a good way
- NO! Workshops we had were a great idea
- No, I enjoyed the presentations! and I thought they were a good way to learn, socialise and gain confidence

Those in favour of a written report typically indicated that a written report might be a good idea, for example:

- Good idea, but current assessment great

and one student identified that written reports might not give them feedback from which they could benefit:

- Yes, but a lot of feedback required to know if report is written in correct format and covers precisely what is being asked

The students contributed numerous positive comments on the course, highlighting both the content of lectures and workshops, and the value of the group work:

- The way the teaching was done by having guest lecturers was great and then having to do our own research and talks were a great way to learn
- Lectures and workshops are brilliant
- Group assignments – provide teamwork and help students to meet many others in the course
- The workshops; working together with other students not only helped us to meet new people, but was a very effective way of learning material.
- The workshops were good for each theme we had to do, most of the topics are relevant for my course, the guest lecturers were excellent, this was my favourite class. Even though I still suck at them the presentations have helped big time with speeches

4 DISCUSSION

Overall the revision of lecture and workshop content and the format for the course, Topics in Biosciences, resulted in very good learning outcomes and greater student confidence in their oral communication ability (Fig. 1). The allocation of students to three different research teams allowed
friendships to be formed and enhanced the general camaraderie of the entire workshop group. The use of computers for internet access during the workshops shifted the focus from a tutor trying to generate discussion and interaction from an often passive audience to student-centred learning. The majority of students found the workshop topics interesting and relevant to their courses, and tasks with relevance and authenticity are known to help people learn (Dearn 1997). The students were able to extend their knowledge on particular questions through their own research strategies and the formation of small teams of students per research topic further enhanced learning and understanding. The students had the chance to discuss findings, explain what they had discovered to other members of the team who were working on a different aspect, and finally know their topic well enough to present it clearly to the larger workshop audience.

Oitzinger and Kallgren [2] cite evidence that integration of ideas across disciplines enhances critical thinking, compared to outcomes when students study the same material but in different courses. Although this outcome was not specifically tested in the Topics in Biosciences course, the surveys revealed that the majority of students found the course content had helped them to discover other applications in science, had revealed some possible career paths and had increased and broadened their interest in science. For example:

*Overall a very rewarding course as I learnt a lot and every topic was interesting.*

*Overall thought this course was really good. It informed me on aspects in biosciences that I never thought of.*

*Gained valuable insight into the variety of fields of study within science.*

Many students initially expressed grave reservations about giving an oral presentation but there was a remarkable change in attitude as the course progressed (Fig. 1). Some of the mature-age and international students were concerned about having to use PowerPoint for the first time. However, they discovered that this was not such a challenge once they had completed some simple exercises in the early workshops with the tutor, or with fellow students. For the oral presentations, some of the students who had prepared good slides for their portion of the first presentation, but had not heeded advice to practise out loud beforehand, discovered that a conceptual understanding and familiarity with their slides did not translate into the ability to speak fluently to the whole class. However with non-threatening advice from the tutors and collegial support from the other students they achieved an enormous improvement in subsequent presentations, with one English-Second-Language student telling us that she had, this time, practised it all out loud and was much more confident. This showed in the enhanced presentation.

Although many students had previously identified “reading from notes or directly from PowerPoint slides” as something they really disliked, this did not stop some of them using palm cards, or projecting a slide with vast amounts of information in small font that they then read to the audience. These students received feedback to show them other ways that they could keep the essential information but in a form that would stimulate a spontaneous delivery instead of a stilted, dull reading. Overall the students were exposed to good, innovative, sometimes humorous, and sometimes dull presentations, all of which contributed to a greater understanding of what strategies can make an outstanding presentation. Copies of all the presentations uploaded onto the course web site also provided a chance to compare their own production with what other workshop groups had produced, and the files formed a valuable revision source.

It was notable that not a single respondent in the final survey identified the presentations as a poor feature of the course. Instead, many students singled out the presentations as an aspect of the course that was done well and should be continued:

*I thoroughly enjoyed the presentations.*

*The speeches assessment. Researching a lot makes your learn heaps.*

*Doing presentations was a good idea, help to be more confident.*

*The presentations in groups:*
  - get to know people in the course
  - learn about different topics that are interesting
  - confidence building

*I enjoyed all presentations in lectures and workshop talks were fun.*
As described in the results, the same positive message about the value of the presentations came through when students were asked whether one of the presentations should be replaced with a written assignment. Whilst many could envisage some value in a written assignment, especially if students could choose their own topic, they were generally reluctant to see a reduction in the number of oral presentations. Many of the students enjoyed the presentations and believed that by doing them they learnt a lot and made new acquaintances. Although first year students may not have realised it, all the skills that they started to develop whilst participating in this course are the very ones regularly identified as essential to future careers. These include skills in oral and written communication, public speaking, ability to manage others and effective team leadership [3].

As would be expected for any newly revised course, there were some areas that need to be improved. The students correctly identified some inconsistencies in the way that their talks were assessed. The team presentation as a whole was given a mark for the quality of references used, but some students resented the fact that their own exceptional effort compared with others in the team was hidden by the listing of all references as a single block at the end of their presentation. Also, the need to present five different research topics in a 110 minute period meant that there was restricted time for immediate feedback to the students on the good features of their talk and on features that could be improved. This was disappointing for many students who were very keen to hear our suggestions. This problem could be overcome by increasing the number of workshops and reducing the workshop class sizes down to a maximum of 16-20 students, so that only four research topics would be needed. This increase in workshop repeats does however have extra cost implications.

For this course to maintain its good learning outcomes several features need to be maintained. We have adopted many of the active learning strategies advocated by McClanahan and McClanahan [4] such as reducing the lecture content, having the students actively seek information in the workshops, and facilitating interactions with staff who are able to provide feedback and encouragement to the students. Some of these changes are acknowledged in the comments made by the students:

- Tutorials very informative and interactive
- "Lots of support from tutors and lecturer. *High levels of learning support"
- Variety of topics. Oral presentations. Interaction between teaching staff and students. Replies to emails.
- The instructors have really done well in all aspects of the course

The continued use of lecturers and tutors who support and practise an interdisciplinary approach is vital if we expect the students to adopt a similar approach to science [2].

The introduction of computers into the workshops was a major change in this course which assisted a shift from teacher-centred to student-centred instruction. The computers allowed rapid access to vast amounts of information but more importantly required students to be interactive users. They needed to explore and assess the quality of the information, then customise it for a particular purpose (e.g. to answer research topic questions). They were then required to use the computer as a production tool to organise knowledge, and construct summaries that use text or images to communicate with others. Finally, the requirement for students to produce team presentations based on their research findings proved to be unanimously endorsed by the students as an activity that they enjoyed, despite early reservations. The students acknowledged that the presentations helped them learn and contributed to a significant improvement in their confidence at giving oral presentations. As one student commented:

- I think the presentations are very important in providing students the skills and the confidence to present material to their peers – a skill required in all science pathways

References

