

Pedagogical Approaches to Enhance Student Learning in the New Inter-professional Health Science Units at the Australian Catholic University

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Abstract: Nursing and Physiotherapy student attendance at lectures in the new inter-professional unit, Human Biological Science 1, was variable and poor at times. Students' learning behavior was observed, and they were influenced to develop effective study habits. In addition, several changes were made to the way lectures and unit content were delivered in the second semester unit, Human Biological Science 2. Students' academic performances in the two first year units were analyzed. Compared to Human Biological Science 1, there was a reduction in failure rates and increase in the proportion of students achieving higher grades in Human Biological Science 2. The changes made in the lecture pedagogy and the delivery of the science content led to remarkable improvements in student engagement and academic performance in the second semester unit.

Key words: engaging students, inter-professional education, health science

1. Introduction

Health science is taught as inter-professional units to first year undergraduate students enrolled in Nursing and Physiotherapy degree programs at the Australian Catholic University (ACU). The revised curricula — Human Biological Science 1 (BIOL121) in semester 1 and Human Biological Science 2 (BIOL121) in semester 2 — were taught for the first time in 2012. BIOL121 was designed as a foundation course in human anatomy, biochemistry and physiology, whereas BIOL122 incorporated microbiology, pathophysiology and pharmacology. During the first three weeks of semester 1, student attendance at lectures varied between one-third and two-thirds of the cohort. Other signs of disengagement included coming to lectures late and leaving early, and lack of interest and motivation. Tutorials and practical laboratory classes were well attended throughout the first semester. This could be partly due to the fact that attendance at lectures was not a compulsory requirement, and because students had online access to course notes, including lecture notes. There is a variety of learning styles present in a tertiary learning environment, and some students may not be reached by the standard lecture format (Wehrwein et al., 2007).

The failure rate in assessments in Semester 1 was found to be high (> 10% of cohort). For instance, the result of the mid-semester assessment in Semester 1 was: Fail 29.0%, Pass 41.0%, Credit 16.3%, Distinction 9.8%, and High Distinction 3.8%. The aims of this study were to investigate how student engagement (including lecture

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attendance) could be increased, and to improve student learning in order to reduce the failure rate in assessments to below 10% for the cohort.

2. Methods

Student engagement and academic performance in the Human Biological Science 1 unit were monitored during the semester. After an examination of the unit design, the science curriculum, and student's learning behavior, the changes required to improve student engagement in the science course were identified. It was necessary to evaluate the effectiveness of lectures as a teaching strategy in inter-professional education. Several innovative strategies were implemented for the semester 2 unit, BIOL122. The research team enacted the several changes to the delivery of the lectures (as explained in the following paragraphs).

The format of lecture notes was standardized so as to avoid the extremes of brief (2–3 pages) outlines only or extensive notes (8–9 pages). Four to five pages of written notes (with up to 3 diagrams as necessary). Students were referred to the text-book for diagrams. In each set of lecture notes, about ten key words were omitted so that the students were required to attend the lectures to be able to then insert the missing words during the PowerPoint presentation.

At the beginning of the lecture, the subject matter was briefly introduced by outlining the Lecture Objectives, covering definitions, and emphasizing the importance and relevance of the topic (e.g., the body organ system being taught). Sufficient time was spent to establish the context before elaborating on detail. Lectures were made a little less formal by allowing students to ask questions at anytime for clarification. In the lectures, tutorials and practical laboratory classes, more visual aids such as diagrams, animations and graphs were included, and students were encouraged to interact and participate in discussions.

A summary of the main points (i.e., main structures and functions of the organ system) was presented towards the end of the lecture. The summary included up to five sample questions, followed by discussion of the answers. In order to provide an incentive to attend the lectures, these sample questions were deliberately not included in the lecture notes posted online. At the end of the lecture, the content of the following lecture was outlined to prepare students for forthcoming topics and to raise interest in the subject matter.

The qualitative component of the study involved purposive sampling: before and after their lectures, the two lecturers of the unit regularly conversed with the students about various issues such as student welfare, attendance and learning. Both lecturers maintained a written record of student comments in their electronic notebooks.

Other initiatives that were implemented throughout the semester include academic-led and individual student consultations, and the provision of more supporting material online: directing reading, supplementary notes, important announcements, and revision guide for formative assessments (such as class test and examination). All students were encouraged to approach the lecturers to ask any questions and seek clarification about the course (including the course notes).

Student performance (i.e., the proportion of fail, pass, credit, distinction, and high distinction grades) in each of the two semesters was compared for evaluation of the teaching strategy. Descriptive statistics were computed using SPSS 19. The non-parametric, Chi-Squared test was used to interrogate the data.

3. Results

The changes made to how the lectures were delivered contributed to student learning and performance. Students' learning behavior had changed: student attendance at lectures, their level of interest, and academic performance had improved in the second semester. Students showed increased motivation, interest and enthusiasm in learning the course content, and were staying behind after the lectures (including tutorial and practical classes) to ask relevant questions.

Some students made comments that they had missed lectures due to logistical reasons such as *"the car broke-down"*, *"I was sick"*, *"had a clinical appointment"*, and *"timetable clash"*. A few revealed that they had to prioritise competing commitments, such as assessments, work, and family.

Statements made by individual learners provided evidence of student engagement in lectures. These include comments such as:

"I take my laptop into lectures and supplement lecture outlines with detailed notes."

"I use an iPod to record the lectures and afterwards repeatedly listen to the audiofiles to transcribe and make detailed notes."

"I use my digital camera to take snapshots of the PowerPoint slides that have useful diagrams."

Other positive comments cited by those who regularly attended lectures included: "lectures are important part of university experience, and I also enjoy socializing with other students", "I found that I learn best with my group of student friends", "I am motivated by lecturers who are my real mentors", and "I get much inspiration and satisfaction when I'm in [the] lecture auditorium — such a scholarly learning environment!".

Several students disclosed reasons why they would no longer skip lectures. This is summed up by the following student comments:

"I missed a couple of lectures at the beginning and paid a penalty in my first assessment. I now find them [lectures] too valuable as they introduce a topic and set the context for further study. Attendance at lectures has helped me to structure my learning."

"I used to mentally switch off during bio[logy] classes. Nowadays, I'm intellectually challenged by the science lectures and share your [lecturer's] enthusiasm for the topic. I am also motivated to borrow books from library to read further."

"I have been finding the lectures exciting as I realize that they help me to organize and integrate the learning from tutorials and lab sessions, and enable me to prepare well for assessments".

Some students are challenged by limited time for study, both on-campus and off-campus. This is exemplified by the following comments from a few mature-aged students:

"Hard to juggle family, work and study. When I see others in the lecture theatre, who are committed to learning, it helps me become more serious about my study."

"I'm the primary carer for my [elderly] mum. I don't really have much of a social life, and there is [sic] not enough hours in the day for extra study."

Table 1 shows the summary of the student results in Semester 1 and Semester 2. The assessment structure was similar for the two semesters: mainly multiple choice questions, some questions requiring short answers, and a group oral presentation. In Semester 2, there was a significant reduction in the proportion of students achieving a score below the pass mark and a significant increase in the proportion of students achieving higher grades.

Table 1 Comparison of Academic Performance of Students in Semesters 1 and 2

Grades (%)	Semester 1 (N = 529) % (n)	Semester 2 (N = 519) % (n)
Fail (< 50%)	12.3 (65)	5.2 (27)*
Pass (51–64%)	52.6 (278)	31.2 (162)*
Credit (65–74%)	21.9 (116)	39.3 (204)*
Distinction (75–84%)	11.2 (59)	20.8 (108)*
High Distinction (> 85%)	2.1 (11)	3.5 (18)

*Significant difference ($p < 0.05$) between Semester 1 and Semester 2 results

4. Conclusions and Future Directions

This study highlights the value of effective lecture pedagogy in fostering student engagement and improving academic performance. Changes made to the lecture pedagogy (such as modifying material, providing summary, and previewing) improved student engagement. The success of the lecture pedagogy may be due to the fact that the lecturer introduces a topic and gives structure to students' reading. In addition to indicating the depth of reading and knowledge required for the topic, the lecturer becomes an inspirational role-model by motivating and engaging students. Whilst academics may strive to provide a more stimulating and interactive learning environment on campus, many tertiary students have time constraints, and domestic and social pressures. In the current, challenging times of conflicting priorities, students are required to manage their time wisely and be more vigilant and committed to study. If students perform well in the first semester, they are more likely to remain in the course; whereas poor achievement is very likely to result in student attrition from the course (Robinson et al., 2010; Krause et al., 2005).

Science education is enhanced for health-related disciplines if:

- students realize the relevance of science to clinical practice (Jordan et al., 1999; Caon & Treagust, 1993),
- relevant complex details can be simplified, and irrelevant details are omitted, i.e., they will learn more from a reduced content. Content overload will compromise learning (Mehta, 2011; Mehta et al., 2008),
- students adopt an optimistic (“can do”) attitude and do not fear science (Mehta, 2011; Robinson et al., 2010),
- various learning styles (aural, visual, kinesthetic, read-write) of students can be accommodated through multi-modal teaching (James et al., 2011; Mehta, 2011),
- learning can be made enjoyable through innovative teaching (e.g., interactive, scenario-based tutorials; inquiry-based learning; problem-based learning) (Smith & Coleman, 2008; Bebb & Pittam, 2004),
- students regularly attend on-campus classes and support facilities (e.g., library services, academic writing skills workshops) (Mehta, 2011),
- students participate in academic-led peer support program (“learning communities”) (Robinson et al., 2010; Noble & Henderson, 2008; Wilson et al., 2006),
- students devise a realistic study plan and routinely spend off-campus time to develop effective study habits (e.g., preliminary reading, reading text-books, using dictionaries (medical, English), asking questions, summarising notes as dot points) (Mehta, 2011; Mehta et al., 2008).

There is a risk that the didactic lectures only promote superficial learning as students may become bored and disengaged, absorbing some of the content only and remembering even less (Domizio, 2008). Other drawbacks with the lecture format are that students may be reluctant to ask questions in large groups and there would be insufficient opportunity for ascertaining student understanding. However, the lecture remains a popular teaching

strategy in tertiary education (Gysbers et al., 2011), capable of quickly introducing key concepts to a large group for further study (Matheson, 2008). Other benefits of lectures include personal approach of lecturer and set environment (Domizio, 2008). It is likely that the convenience of web-based lecture technologies (access to online lectures recorded digitally in real time) together with competing priorities (such as commitment to paid employment) tempt students to miss lectures. Such students who are deprived of the opportunities for social interaction and timely engagement of content are more susceptible to poor performance (McKinlay, 2007).

As the allied health sciences at ACU has continued to expand across six national campuses, BIOL121 and BIOL122 will be offered as inter-professional units in 2013 onwards to the undergraduate degree programs in the following disciplines: Applied Public Health, Exercise Science, Midwifery, Nursing, Occupational Therapy, Paramedicine, Physiotherapy, and Speech Pathology. Fostering cohort cohesion and influencing students to develop a range of study skills are of paramount importance. For the science education to be effective for inter-professional cohorts, it is imperative that the students are kept motivated and engaged in studies through the provision of stimulating learning approaches and environment on campus.

Further studies are warranted to investigate the needs of students from diverse backgrounds and varied health disciplines so that science education remains relevant. Detailed studies of how students of different health disciplines learn and prefer to be taught are required to inform best practices in science education of multidisciplinary cohorts. Parameters that need to be tested include the suitability and reliability of a common curriculum, assessment structure, and academic performance indicators.

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