Mixing Teaching Approaches to Maximise Student Learning Experiences

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SESSION: C1: Integration of theory and practice in the learning and teaching process

CONTEXT Postgraduate student education is a highly dynamic environment that experiences significant fluctuations in regard to the make-up of the student cohort and their educational expectations. Like all educators, we seek the best learning and teaching methods to maximise student outcomes. Therefore, the educator must be dynamic and embrace the notion that varying teaching and learning approaches may be necessary – even in the same course/subject.

PURPOSE The aim of this study was to examine how fee-paying coursework postgraduate students perceive different teaching approaches in a traditional-type of course/subject and, therefore, what approaches should be improved/pursued/adopted in the near future.

APPROACH Over a three-year period, a new postgraduate course delivered to cohort of students with diverse educational and cultural backgrounds was examined to see how different teaching approaches were perceived by the students. The course/subject is contained within a traditional chalk-and-talk program taken (mostly) by fee-paying (chiefly overseas) postgraduate students. Two approaches were used sequentially during the delivery of the course - the first was the approach of interactive lectures and supportive tutorials, while the second was based on problem-based learning and with supportive workshops. At the end of the course, formal feedback was obtained from students to see how they perceived the teaching approaches used, and where improvements can be made.

RESULTS Results from the formal student surveys indicated that students appreciated both methods of delivery, with high satisfaction results being achieved for both approaches. The students showed no preference of teaching approach employed, and their performance—as assessed through formal measures (assignments, exams, reporting and presentations)— again showed that both teaching approaches were successful. Informal feedback was also obtained, and it was clear that students felt that the professionalism and availability of the staff were factors that were critical to achieving high student satisfaction outcomes.

CONCLUSIONS It was concluded that the exact method of delivery of the course components did not have a significant impact on the learning perceptions of the students, which was similarly reflected in their assessable items. Both methodologies, and their combined impact, proved highly satisfying to the students. It was apparent that the main factors influencing students were professionalism and accessibility to the staff which, while known, seems to be critical to the postgraduate cohort.

KEYWORDS Postgraduate education, learning styles, flexible delivery

Introduction

With the changing educational environment throughout the world, there are growing demands on educators to be proactive in determining what is the best educational approach to our postgraduate and undergraduate tertiary students. Indeed, this extends to all forms of educational environments, including the TAFE and professional sectors, across all disciplines, with engineering education being just one of them.

Postgraduate student education is a highly dynamic environment that experiences significant fluctuations with regards to the makeup of the student cohort and their educational expectations. This is due in part to the students' varied cultural backgrounds and learning approaches. Like all educators, we seek the best learning and teaching methods to maximise student outcomes (eg Felder et al, 1995 and Mason et al, 2012). Therefore, the modern educator must be dynamic and embrace the notion that varying teaching and learning approaches may be necessary within a degree (or graduate diploma, etc) program, and even in the same subject (which, in some universities, is referred to as a unit and even a course). Interestingly, Prince (2004) found that that "*there is broad but uneven support for the core elements of active, collaborative, cooperative and problem-based learning.*" However, as time progresses the concept of flexible teaching and learning approaches is gaining greater credibility.

It has been known for a while that the so-called traditional chalk-and-talk approach is not an ideal method of education in many contexts. For example, Mills and Treagust (2003) stated that: "*The use of project-based learning as a key component of engineering programs should be promulgated as widely as possible, because it is certainly clear that any improvement to the existing lecture-centric programs that dominate engineering would be welcomed by students, industry and accreditors alike.*" More recently, published work such as Ramsden (2003), Bishop and Verleger (2013), Sano et al (2014) and Borras-Gene et al (2016) reveal that different approaches have different impacts on the engineering student's learning ability. Significantly, the approaches are varied, there is no "one-size-fits-all" approach and they do not all follow the traditional approaches.

Connor et al (2015) pointed out that: "*the only real limitation on cultivating such approaches is the disciplinary egocentrism of traditional engineering educators*". As such, the aim of this study was to examine how fee-paying coursework postgraduate engineering students perceived different teaching approaches in a traditional type of course/subject; and therefore, what approaches should be improved/pursued/adopted in the near future to help enhance the student education experience.

Approach

To look at how students may be impacted through a varied educational approach, this small-scale study was conducted over a three-year period within an initially new postgraduate civil engineering course (in 2015), and delivered to a cohort of students with a diverse educational history (though generally based upon traditional civil engineering training). The students had wide-ranging cultural experiences and, therefore, presented a range of (non-quantified but observed) learning styles and expectations. The course used in this study was entitled "Advanced Water Engineering Practice". It was contained within a traditional chalk-and-talk delivered style masters of engineering program taken mostly by full fee-paying postgraduate students who mostly came from overseas.

The objective of the course was/is: "*Throughout history, human civilization has developed near coastal water bodies. Unfortunately, this essential resource is relatively under threat due to climate variability. Therefore, it is essential that this scarce resource is carefully managed to ensure sustainability of both the natural and built environments. The main*

purpose of this course is to investigate recent developments in the engineering principles and processes that are applied to the design and management of sustainable water engineering related projects. It introduces students to advanced engineering design practice utilising real world design exercises and international design codes. The course delivery mode is a combination of lectures, labs and project based workshops. Professionals from industry may be invited to present case studies on with particular emphasis on Australia." This is a rather generic descriptor, with little detail of how the course was to be delivered. To resolve this, students were informed at the beginning of the course that they would experience different teaching approaches throughout, to ensure they would keep an open mind about it. However, they were not made aware beforehand of exactly what the approaches would be.

The course used two sequentially delivered and distinctive learning modules/approaches. The first was the approach of interactive lectures and supportive tutorials, with the tutorials being aimed at working through real engineering problems in a classroom-style setting. This is considered the more normal type of chalk-and-talk approach—albeit that we certainly do not use chalk, and the talking was heavily focussed on students interacting in the lectures and tutorial spaces. It was not a passive delivery approach, but more of an interactive one aimed at enhancing student engagement. These activities were conducted through the first half of the course, with the student's knowledge being assessed through a problem-based assignment and a mid-semester exam.

The second approach used in the course began after the completion of the mid-semester exam. In this part an open-ended problem was set for the students to work through, come up with a solution for, and report on their findings as a team. Rather than lectures, workshops were used, and these were aimed at giving supportive answers to student questions. At the end of this part of the course the students delivered a written report and delivered an oral presentation. The open-ended problem followed on from the initial part of the course and, therefore, they could use the knowledge gained in that section to assist their project formulation and design. For the first two years one academic member delivered the first part, while another delivered the second. In the third year one academic delivered both parts, following the same delivery philosophy.

Formal student feedback was obtained from students at the end of the course to see how they perceived the teaching approaches used, and where they felt improvements could be made. This feedback consisted of both Likert scale data and general comments on the course.

Results and discussion

The results from the formal student surveys used to evaluate the course are presented in Table 1. Students were asked various questions covering their course experience and, for the first two years of delivery, they were also directly asked their thoughts on the two delivery methods.

The results from the surveys, shown in Table 1, clearly indicate students appreciated both methods of delivery, with high satisfaction rates being achieved for both approaches. Indeed, within one standard deviation, there was no statistical difference. This was the case across all questions asked, which covered the assessments, feedback and teaching. The results clearly showed the students had no preference of the teaching approach employed and their performance, as assessed through the formal measures (assignments, exam, reporting and presentations), also showed that the teaching approach used had minimal impact on their performance. That is, the actual teaching method did not influence the overall student performance or how well they perceived their learning experience. This is significant, as there are often calls for educators to move towards non-traditional approaches, but we feel it is usually the quality of the educator that has the greatest impact on student learning and

student satisfaction. Hence, one should not always be pushed to use a particular approach, but instead use that which is most engaging to the staff/student education experience.

Table 1: Formal student feedback with regards to various course related questions. The student could respond with a value of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree)

	2017		2016		2017	
Year of Offer	6/11 Student responses		10/24 Student responses		13/44 Student responses	
Question	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
This course was well-organised	4.7	0.5	4.5	0.5	4.4	0.9
The assessment was clear and fair	4.3	0.5	4.4	0.7	4.2	0.9
I received helpful feedback on my assessment work	4.5	0.8	4.4	0.8	4.5	0.9
This course engaged me in learning	4.7	0.5	4.5	0.5	4.6	0.5
The teaching (lecturers, tutors, online etc) on this course was effective in helping me to learn	4.7	0.5	4.6	0.5	4.7	0.6
Overall, I am satisfied with the quality of this course	4.7	0.5	4.4	0.7	4.5	0.7
The PBL cases were relevant and up-to-date	4.5	0.6	4.1	0.7	---	---
The {theoretical part (first half) used} in this course assisted my learning	4.7	0.5	4.5	0.5	---	---
The {workshop and problem-based learning approach (second half) used} in this course assisted my learning	4.5	0.6	4.2	0.6	---	---

To help explain the numerical score results, examination of the written student feedback (presented in Table 2) clearly showed that these mature students really appreciated both the professional approach taken by the academic staff and the clarity of their required tasks.

Additional feedback was obtained through informal discussions during the teaching periods. One point that became very clear from this was that the students strongly felt that professionalism and availability of the staff were critical factors for achieving high student satisfaction outcomes. That is, students appreciated direct access to knowledgeable and supportive staff (in this case the teaching team, which consisted of two academic staff and no tutors) who deliberately made time for them. In order to manage this in a way that did not encroach too much on staff time, the professional approach to office hours was enforced. The students certainly appreciated this, which is not surprising as we are training professional engineers. This is in keeping with the findings of Uzun and Senturk (2010), who found that a blended group of education approach resulted in students attaining better course achievement.

Table 2: Written feedback from students for a given year

2015
this course have well combination of the traditional learning approach and workshop with waste water treatment plan design.
Knowledge about water treatment plant are great and really useful for me. Also the seminar about pond design was great.
Theory was very clear
the project is good
2016
I found the teacher-student relationship very helpful.
Lecturers were very helpful and confident. Topic was very interesting and encouraging.
The topic is interesting, and the knowledge will be beneficial.
how to analysis and design the some particular structures I able to know information and able to gain some knowledge
2017
I learnt how to apply theories in practical aspect. It gave me the interest to learn further about this subject.
This course made more familiar with coastal functions and how to design a coastal structure
The way the assignment make you think in practical manner was excellent.
The course convenor has a rigorous teaching attitude and a sense of responsibility.
Clear method and process to learn
The lecturer is patient and helpful.
Very well designed. The assessment plan was nicely balanced. Breakup of learning within lectures and tutorials was a good idea to make the course look settle.

In order to investigate the correlation between the SECs and the marks attained, their mean values were compared with those of other courses taken in the same semesters (Tables 3 and 4).

Table 3: Comparison of course marks attained at the end of the semester for this course and the three others held in the same semester (out of 100), 2015-2017

	2015	2016	2017	Mean
This course	64.36	64.96	62.68	64.00
Course 2	72.71	71.33	68.07	70.70
Course 3	72.71	61.89	68.38	67.66
Course 4	65.83	66.46	73.00	68.43
Mean of other courses	70.42	66.56	69.81	68.93

Table 4: Comparison of student responses to the question "Overall, I am satisfied with the quality of this course" for this course and the three others held in the same semester (out of 5), 2015-2017

	2015	2016	2017	Mean
This course	4.70	4.40	4.50	4.53
Course 2	4.50	4.40	4.20	4.37
Course 3	3.80	4.20	4.30	4.10
Course 4	3.50	3.70	3.70	3.63
Mean of other courses	3.93	4.10	4.07	4.03

As shown in Table 3, the average marks attained in this course were always lower than the mean marks of other courses in the last three years (about 5%). By contrast, the SECs of this course were always higher than those of other courses during the same period. Table 3 displays that on average the SEC of this course was about 0.5 (more than 10%) higher. This indicates there is no direct relationship between the marks and SECs of course, and higher SECs are not due to higher marks attained by students.

Conclusions

It was concluded that the exact method of delivery of the course components did not have a significant impact on the learning perceptions of the students, which was similarly reflected in their assessable items. Both methodologies, and their combined impact, proved highly satisfying to the students. It was apparent that the main factors influencing student satisfaction levels were professionalism and accessibility to the staff in a timely and meaningful manner.

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