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Original Research

Incorporating online teaching in an introductory pharmaceutical practice course: a study of student perceptions within an Australian University

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ABSTRACT[*]

Objectives: To examine student perceptions regarding online lectures and quizzes undertaken during a pharmaceutical practice course for first year undergraduate students enrolled in the Bachelor of Pharmacy course at an Australian University.

Methods: The University uses a standard instrument to collect feedback from students regarding unit satisfaction. Data were collected for three different teaching modalities: traditional face-to-face, online and partially online.

Results: Descriptive statistics support that, from a student's perspective, partial online delivery is the preferred teaching methodology for an introductory pharmaceutical practice unit.

Conclusion: This study has served to highlight that while there are a few points of significant difference between traditional and online teaching and learning, a combination of the two provides a reasonable avenue for teaching exploration. This result has implications for teaching practice generally, and within the pharmacy discipline, specifically.

Keywords: Education, Pharmacy. Education, Distance. Computer-Assisted Instruction. Australia.

INCORPORANDO LA ENSEÑANZA ON-LINE EN UN CURSO INTRODUCTORIO DE FARMACIA PRÁCTICA: ESTUDIO DE PERCEPCIONES DE LOS ESTUDIANTES EN UNA UNIVERSIDAD AUSTRALIANA

RESUMEN

Objetivos. Examinar las percepciones de los estudiantes en relación a las clases y exámenes on-line realizados durante un curso de farmacia práctica para pre-graduados de primer año cursando la licenciatura en farmacia en una Universidad Australiana.

Métodos: La Universidad utiliza un instrumento estándar para recoger la retroalimentación de los estudiantes sobre la asignatura. Se recogieron los datos de tres diferentes modalidades de enseñanza: tradicional presencial, on-line, y parcialmente on-line.

Resultados: La estadística descriptiva apoyó que, desde el punto de vista del estudiante, em método de enseñanza preferido para un curso introductorio de farmacia práctica es parcialmente on-line.

Conclusión: Este estudio sirvió para subrayar que, mientras que existen algunos puntos significativamente diferentes entre la enseñanza y el aprendizaje tradicionales y on-line, una combinación de los dos proporciona una situación razonable para la exploración docente. Este resultado tiene implicaciones para la enseñanza en general y para la disciplina de farmacia específicamente.

Palabras clave: Educación en Farmacia. Educación a Distancia. Instrucción por Computador. Australia.

INTRODUCTION

The same networking and computing technology that has revolutionised global commerce, and many other facets of modern life, is now being targeted at education.[1] Between 2000 and 2001 Washington researchers[2] reported an estimated 2,876,000 individuals were enrolled in distance education courses, with 82% of these at the undergraduate level. The term distance education is defined by these researchers to describe any courses that are delivered to students who are not present in the same room.[2]

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It is estimated that in the United States, enrolment in online classes is increasing by 33% each year.[2] In a report examining the current status of online learning in Australia[3], participating organisations reported that they were expecting to more than double the use of the internet to deliver training or provide access to e-learning. E-learning is a popular term used to describe any learning that is electronically mediated or facilitated by transactions software. Web-based education can combine elements of distance education and e-learning and more specifically includes internet and any communication technology to facilitate the learning process.[2]

Reduced costs, accessibility, speed and improved learning outcomes are cited as the main reasons for choosing online methods of delivery.[3] Online delivery of learning materials also offers the opportunity to meet increasing expectations and demands from consumers who want greater flexibility in the way they receive their learning. This is particularly pertinent with regards to teaching members of Generation Z.

Generation Z individuals born in or after 1990 are unique because their birth coincided with the introduction of the graphical web, the precursor to the internet.[4] These youths born into the world of laptops, mobile phones, instant messaging, broadband, video games and other 'high tech' influences, are more likely than the previous generation to evolve as electronic multi-taskers and have heightened technical expectations, attitudes and beliefs. As such, it is thought that perhaps by educators implementing e-learning modules it may help to minimise the generation gap between themselves and their students, assist in developing adolescents' technology and information literacy skills, and prepare students to be lifelong independent learners.[4]

Harper *et al*.[5] reports that there is much exploration and experimentation with the delivery of online learning. Very few instances of pure online learning are reported. A mix of face-to-face activities and online activities forms the basis of many educational courses, especially those delivered within a university environment.[6]

Most research within the education sector suggests there has been a shift of emphasis from face-to-face teaching to a "guide on the side" model.[7] This "guide on the side" model reflects an educators role in facilitating a learning process, emphasising the student as a self-motivated, persistent learner, sharing in the responsibilities of achieving his or her own education objectives. Candy *et al*.[8] suggest that such a model offers more flexible open learning and focuses on improving access to learning resources, thereby making access to education and the experience of education more equitable.

A plethora of research exists which examines the knowledge outcomes of diverse teaching modalities. Research which examines the differences in academic achievement when alternate teaching practices are used has presented mixed results. For example, Faux and Black-Hughes[9] compared traditional, online and hybrid sections of an undergraduate course in social work to determine the effectiveness of online learning. Their results showed most improvement for students in the traditional face-to-face section. Brown and Liedholm[10] found that students enrolled in their "virtual" classes of microeconomics, performed significantly worse on examinations than the "live" students.

This is in contrast to Brown and Kulikowich[11] who compared online and standard lecture course outcomes for graduate level statistics students and found no significant differences.[2] Maki *et al*.[12] showed that online instruction could be even more effective for students' learning than traditional instruction by observing that psychology students enrolled in online sections of a course acquired more content knowledge and performed better on in-class examinations than those in lecture sessions. These results are echoed by a study conducted in a Malaysian university where students of multimedia design enrolled in online classes outperformed students in the traditional classroom in course work, final examination grades and course grades.[2]

Hauck[13] reports on the effectiveness of distance education to that of face-to-face classes in 355 comparison studies. Hauk[13] studied fashion merchandising students in a Midwest university during 2004 and 2005 spring semesters. The numbers of students enrolled were 146 and 147 respectively. The course itself had the same instructor, textbook, lecture slides, quizzes, exams and assignments, but in 2004 the classes were delivered in a traditional face-to-face setting whereas in 2005 they were delivered online. The mean final course grade was 85.52% for the face-to-face class and 84.9% for the online class, not a statistically significant difference. These results support the literature that online courses are as effective as traditional face to face teaching regarding student achievement.

Fraser and Dean[14] suggest that flexibility in teaching and learning can be provided in a number of ways – through the resources made available, through the interaction between learners and through the support provided for learners, and that these variations in teaching approaches can have differential effects on student satisfaction, motivation and engagement.

In 1991, Trigwell and Prosser[15] identified a relationship between student perceptions of their learning environment and their approach to learning outcomes. Some of the factors outlined by these authors that have an effect on student perceptions of good outcomes in learning include appropriate workload, and independence and choice in learning. Other researchers[16] report on a study that outlines student's perceptions about the advantages of online learning as opposed to traditional methods to include: saving time, scheduling and being able to take more courses. Koohang and Durante[17] collected information from 106 students enrolled in a hybrid management program and overall results indicated that web based or distance learning

activity portions of their coursework promoted favourable learning outcome perceptions.

Freeman *et al*.[18] reported on 124 students enrolled in a WebCT based introductory drug information course to determine student perceptions of online lectures and quizzes presented as part of this course. More than 47% of students reported that online lectures helped them learn the material better, and 59% reported that they would use WebCT lectures for future classes. Approximately 40% of students agreed that online lectures should be used in future courses. In addition, these authors found students had a positive perception of WebCT in regards to accessing the learning materials using both on- and off-campus computer terminals, flexibility in accessing the materials, and clarity in the feedback addressing performance. In general, the researchers noted that students felt that online lectures helped them learn the subject matter.

Crouch in 2009[19] studied the effectiveness of online instruction in a cardiology pharmacotherapy elective. The researcher concluded that a blended learning environment with online and face-to-face instruction is an effective way to teach a cardiology pharmacotherapy elective. It was also noted that the online component of this course was well received by students, improved student preparation before attending class, and appeared to enhance long-term cardiovascular drug knowledge. Of particular note in this research, according to students, is that this approach stimulated interest in the respective topics, enhanced understanding, and was easy to use. The majority (99%) of students 'agreed' or 'strongly agreed' with the statement that online drug focused lectures should continue as part of this course. When asked how faculty members should use online introductory presentations in the future, 81% of students stated the same number of presentations should be used, 8.3% suggested more be employed, 9.5% suggested less be used, and 1.2% selected that none be provided.

This study has suggested that within the pharmacy discipline student perceptions of blended learning may have an impact on achieving learning outcomes.

Overall, researchers have considered[13] that a hybrid format of teaching delivery creates a sense of community, fosters relationships, and may help with student success in the e-learning field by motivating and engaging students.

However, because online instruction and learning still constitute a relatively new frontier in pharmacy education, research is needed examining the perceived student benefits of different styles of teaching.[16]

The aim of this research, with particular emphasis on the pharmacy curricula, therefore is to examine student perceptions of an introductory pharmaceutical practice course across three teaching modalities.

METHODS

The "guide on the side", interactive and technology based learning approach, and the idea of a self-directed learning student is advocated as part of the involved University's philosophy of teaching and learning. In particular, this approach is related to the accepted graduate attributes which encourages the application of professional skills - demonstrating an ability to work independently (Attribute 9) and that independent learning and development and use of lifelong learning skills (Attribute 6).

To date, the School of Pharmacy at this University, has had limited opportunities to explore online learning in an undergraduate environment. However, after examining student feedback, the researchers considered conducting an introductory unit in pharmaceutical practice using an online teaching model. This unit was chosen as the concepts are basic, material is easily incorporated into an online learning format and practical work affords itself to this approach.

An introduction to the basic profession of Pharmacy is fundamental to a first year bachelor's Pharmacy degree. As such, Introduction to Pharmaceutical Practice has long been embedded in the curriculum of the School of Pharmacy course at the University involved in this study. On average, 165 students are enrolled in this course and it has been run as either a first or second semester unit. Data was collected from three semesters in 2006, 2007 and 2008 for the purposes of this study. All students who participated in the study were enrolled as first year pharmacy students.

In 2006, this unit was run in a traditional face-to-face teaching modality. Eighteen lectures were provided to students with face-to-face tutorials, assignments and a final year examination. In 2007, the unit was altered to reflect changes in technology and somewhat in response to comments received about the workload of pharmacy students in general. The unit outline was altered to exhibit a largely online approach to the teaching of this unit.

The 18 lectures of 2006 were recorded in front of a live audience and presented to students on orientation day 2007 incorporated as a DVD package. The package consisted of six discs, with five being lecture material, and the sixth incorporating two tutorials. Students were provided with a support package that consisted of a manual that included a timeline for when the lectures were supposed to be viewed by, directed students to assessments to complete with relevant due dates, and provided additional hand out material that would normally be given during the course of a lecture.

In addition, students were able to view the lecture material via WebCT from any computer, and all lecture notes were made available to students. A final paper-and-pencil examination was conducted as per usual. Students had very limited contact with academic staff and attended only two workshops that were largely used to test student skills in assessing Pharmaceutical Benefit Scheme laws.

After additional feedback via the students, the unit was altered again in 2008 to provide a partially online format. Researchers[2] have described this partially online format as a hybrid or blended course. This partially online course consisted of the same 18 lectures, supplied in a DVD package that could also be viewed on WebCT from any computer as before; however, the tutorial disc was removed. The same support package was utilised for the students and it instructed them to watch the lectures by a certain date and when assessments were due. In addition, four face-to-face tutorials were provided on a fortnightly basis. After each tutorial, students completed an in-class assessment, in the form of a quiz, to confer understanding. A mid- semester test was also introduced in this mode. Students were able to revise the course using online quizzes from which they could practice. Furthermore, in the 2008 innovation, one assessment was made available for completion online. Contact with academic staff occurred on a fortnightly basis and feedback was provided to the students on these occasions.

Researchers note that changing the way in which an online course is delivered is not unusual. Dykman and Davis[1] suggest that is not uncommon to deliver one class one semester, a completely different way the next and maybe a third way after that. This rationale supports the approach taken in this study.

Measures

To obtain an assessment of these different approaches to teaching, feedback from student unit evaluations was used to determine if there were any differences in student perceptions across the three different teaching modes. The first mode (face-to-face) was considered to be a traditional teaching approach (n=57). The second mode (online) was predominantly online with limited staff contact (n=76) and the third mode (partially online) (n=72) was partially online and partially taught via the traditional teaching mode as discussed.

The University uses a standard instrument to collect feedback from students regarding unit satisfaction which has been validated by Oliver *et al*.[20] The questionnaire, which students complete online is made up of 11 items which ask students to rate on a 5-point scale to what extent they agree (5) or disagree (1) with the following statements:

Q1. The learning outcomes in this unit are clearly identified.
Q2. The learning experiences in this unit help me to achieve the learning outcomes.
Q3. The learning resources in this unit help me to achieve the learning outcomes.
Q4. The assessment tasks in this unit evaluate my achievement of the learning outcomes.
Q5. Feedback on my work in this unit helps me to achieve the learning outcomes.
Q6.The workload in this unit is appropriate to the achievement of the learning outcomes.
Q7. The quality of teaching in this unit helps me to achieve the learning outcomes.
Q8. I am motivated to achieve the learning outcomes in this unit.
Q9. I make best use of the learning experiences in this unit.
Q10. I think about how I can learn more effectively in this unit.
Q11. Overall, I am satisfied with this unit.

The questionnaire also provides students with the opportunity to provide comments on the most helpful aspects of the unit and solicits suggestions for unit improvement. However this information was not used in this study.

No individual level data is collected as part of the unit evaluations, and hence no demographic information about the sample profile can be reported.

Data Analysis Procedures

The data were screened using the Statistical Package for the Social Sciences (SPPS v.17). A listwise deletion of missing cases was used and outliers were examined to ensure extreme values did not influence the results.

Descriptive statistics were used to determine if there were any differences in student perceptions of an introductory pharmaceutical practice unit across three different teaching modes. Oliver *et al*.[20] suggest that analysis of the scales should only take the form of reporting percentage 'agreement' with each item based on factor analysis and RASCH analysis outcomes. Hence, using other types of analyses, such as Analysis of Variance, was not possible.

The results are presented in three sections. The first section presents information about overall unit satisfaction. The second section compares student responses about what helps their achievement of learning outcomes (items 1-7 in the survey) over the three teaching modes. The third section looks at student's level of motivation and engagement (items 8-10 in the survey) over the three teaching modes.

For the purposes of this study percentage agreement relates to frequency of responses in the 'agree' (category 4) and 'strongly agree' (category 5) categories of the 5-point Likert scale.

RESULTS

Overall, students seemed satisfied with the way in which the unit was taught, irrespective of teaching mode. However, the descriptive results provided evidence that students were more satisfied with the unit when it was being taught partially online.

Figure 1 isolates Question 11 from the survey which asked respondents to what extent they agreed or disagreed with the following statement: "Overall, I am satisfied with this unit".

Ninety-five percent of respondents agreed that they were satisfied with the partially online delivery of this unit. Ninety-four percent of respondents agreed that they were satisfied with the traditional delivery of this unit, when compared with 80% of respondents who agreed they were satisfied with the online delivery mode.

In general, students were least satisfied with the unit when it was run in the online teaching mode with little staff interaction in this study (see Figure 1).

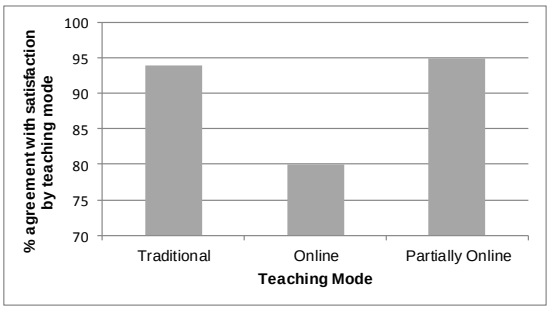

Figure 1. Perceptions of student satisfaction

In terms of achievement of learning outcomes in this study, Table 1 shows that differences in level of agreement were reported in terms of teaching quality evaluation (Q7) between the online teaching mode and when the unit was taught partially online. Seventy-one percent of students agreed that the quality of teaching helped them to achieve learning outcomes in the online mode versus the traditional (95% agreement) and partially online (93% agreement) modes. This is somewhat of an expected outcome given that the online mode saw very limited student-teacher contact.

Table 1. Perceptions of learning outcomes (% agreement with each learning outcome statement by teaching mode)

eValuate survey item	Teaching modes		
	M1	M2	M3
Q1. The learning outcomes in this unit are clearly identified	86	74	97
Q2. The learning experiences in this unit help me to achieve the learning outcomes	99	75	93
Q3. The learning resources in this unit help me to achieve the learning outcomes	95	85	95
Q4. The assessment tasks in this unit evaluate my achievement of the learning outcomes.	93	88	97
Q5. Feedback on my work in this unit helps me to achieve the learning outcomes.	76	48	88
Q6. The workload in this unit is appropriate to the achievement of the learning outcomes.	96	90	95
Q7. The quality of teaching in this unit helps me to achieve the learning outcomes	95	71	93
M1= Traditional; M2=Online; M3=Partially Online.			

Of note are perceptions about the extent to which students feel that feedback helps them to achieve learning outcomes. Only 48% of respondents subjected to the online teaching mode, agreed with this statement when compared to 76% agreement in the traditional mode and 88% in the partially online mode.

Students also report a difference in their workload evaluation when the unit was taught partially online, compared to when the unit is being taught in the online mode only. Ninety percent of respondents agreed that the workload was appropriate to the achievement of learning outcomes when taught fully online compared to the traditional teaching mode (96% agreement) and the partially online (95% agreement) mode.

A similar pattern of results is evident with students in the partially online and traditional teaching mode groups reporting greater agreement with the other learning outcome statements.

In terms of student motivation and engagement, Table 2 suggests that, for this study, the students were least motivated to achieve learning outcomes when the unit was run in the online teaching mode with little staff interaction (73% agreement). Students agreed that motivation was greatest to achieve learning outcomes in the traditional teaching mode (93%) and then the partially online mode (89%).

Table 2. Perceptions of student motivation & engagement (% agreement with each statement by teaching mode)

eValuate survey item	Teaching modes		
	M1	M2	M3
Q8. I am motivated to achieve the learning outcomes in this unit.	93	73	89
Q9. I make best use of the learning experiences in this unit.	89	76	93
Q10. I think about how I can learn more effectively in this unit.	84	73	90
M1= Traditional; M2=Online; M3=Partially Online.			

In terms of engagement, 93% of students agreed that they make the best use of the learning experiences in the unit whilst engaged in the partially online teaching mode, compared to 76% in the online mode. This result was echoed for student perceptions on effective learning. Ninety percent of respondents thought about how they could learn more effectively in the unit when taught partially online versus 73% in the fully online version.

DISCUSSION

The results suggest that overall students are satisfied with this unit. When the unit is being taught partially online, students are more satisfied.

This may be because regular communication is the basic principal behind teaching online.[10] Partially online encompasses one of the biggest advantages to online learning, which is that students can learn whenever it is convenient for them but also provides some structure.[21]

Other Universities with online programs suggest that learning in the online environment allows the student to develop new learning skills that can be useful in life outside education promoting self-motivation and suggesting that learning is most effective when students play an active part in the process thus presenting a more rewarding experience.[22]

Larson-Birney[23] conducted a formative case study course evaluation of an introductory accounting course delivered over the internet. Results showed that although students were confused on how to begin the course, 87% of students indicated they would take another internet course.

Researchers suggest that when there is failure to communicate expectations, which may have been in the case in the fully online teaching mode adopted in this study, and the student is not doing what the teacher intends, the situation can deteriorate without either party realising until it is too late.[1] Coupled with this, if students have taken on line courses before and not had a good experience, these experiences may be brought with them.[1]

Research has suggested that a lack of self-motivation and inadequate technological mastery may contribute to a lack of student satisfaction with a fully online web-based introductory course.[24,25] Student social isolation has also been cited as a possible area of dissatisfaction in online learning.[24,25] Researchers[10] in the field of microeconomics noted that doing as well in an online course as in the live alternative seems to require extra work and discipline beyond that demonstrated by students. Zemsky and Massy[26] have noted that students' attraction to computer games and their quick adoption of most computer based technologies did not translate into an interest in e-learning.

Other research however, does not support this outcome. Nichols *et al*.[27] compared an online tutorial with a traditional lecture for basic information literacy in freshman English composition classes. After measuring both student learning and satisfaction, the study showed comparable results between online tutorials and in class tuition.

This study showed that students perceive that teaching quality helps to achieve learning outcomes favourably in the partially online mode. Hauck[13] found the extent to which the student learnt a great deal from the instructor was considered a significant result with a mean score of 1.60 for the face-to-face classes versus 1.99 for online classes consisting of the same fashion merchandising coursework. Students in the online class felt they had not learnt a great deal from their educator compared to students in a traditional class setting. Hauck[13] considers this a predictable result.

Suggestions have been made that teaching at a distance adds a degree of complexity to the relationship between teacher and student and perhaps the rigidity and minimal feedback aspects of online systems may contribute to this result.[1,28] This outcome provides further support for the importance of academic staff in the student learning experience.

Chandra and Fisher[28] suggest that student feedback is an essential element of online course design, which creates an opportunity for instantaneous feedback. Immediacy of feedback has been shown to influence engagement, motivation and this may explain the results in this study which show less than 50% of respondents agreed that feedback on their work helped them to achieve their learning outcomes.

A similar result was evident when students were asked their opinion about the workload in achieving learning outcomes. Literature suggests that it is difficult for an educator to judge work load levels in an online course.[1] The opposite of this, is that the students can easily over or under estimate the level of effort that is appropriate for a given assignment compared to that intended by the educator.[1] However, Soek *et al*.[16] surmise that perceived workload is related to perceived good teaching and learning which may be a rationale behind the results of this study.

From this study it appears that student motivation to achieve learning outcomes can be influenced by teaching mode adopted. However as the data provides no demographic information, it is difficult to pinpoint whether this result is related to particular student sample characteristics or indeed a result of the teaching mode adopted. Future studies investigating the impact of teaching methods on student motivation to learn should include student profiles for more generalisable results. Additionally, future studies should examine if perceptions relating to enhanced motivation results in better student performance, which was not addressed in the current study.

In relation to student engagement, this study supports that students reported that they were more engaged when being taught in the partially online format. The motivational scaffolding that was used to design the partially online course may have contributed to this result. Pittenger and Doering[29] comment that motivational design in an online environment should attract a student's attention and hold engagement with elements of instructional design. Perhaps the partially online format used in this research is an appropriate mix of supporting confidence and students enjoying study through varied activities. This instructional design format would need to be further studied to provide appropriate research links.

This study is not without limitations which need to be acknowledged. Limitations to this study include that students could not be identified based on demographic characteristics, the questions were not specific to online teaching and student specific comments have not been considered. It is suggested that future research target such limitations in order to improve the meaningfulness of this type of study.

CONCLUSIONS

Teaching online is an exercise in continual incremental improvements. The critical task that lies ahead is to create and disseminate curricula of high quality online that students can embrace and educators can sustain. While opportunities to utilise online facilities for teaching and learning have been available for many years, universities too often show reluctance to engage in the development of these technologies.

Perhaps this study has served to highlight that while there are a few points of difference between traditional and online teaching and learning, a combination of the two provides a reasonable avenue for exploration. The question remains as to whether pharmaceutical practice can benefit from additional virtual educational sessions. This study

provides a platform into future considerations about the impact on learning and the merits of using online instruction in other introductory courses in the field of pharmacy.

CONFLICT OF INTEREST

None noted.

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