UNSW Learning and Teaching Grants and Fellowship Program

Final Report

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Title of project:
An introductory Pathology course as a model for using a blended learning approach in large group teaching

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1. Acknowledgements

We would like to thank Suzanne Mobbs for assistance with publishing modules as SCORM packages, Niki Fardouly and Forrest Duxbury for assistance with the Echo360 Active Learning Platform, Wendy M. Pryor for the NVivo analysis, and all the students who participated in this study.

2. List of acronyms used

PULTS: Perceived utility of learning technologies scale
ALP: Active learning platform
SCORM: Shareable Content Object Reference Model
LMS: Learning management system
ANZAHPE: Australian and New Zealand Association for Health Professional Educators

3. Executive summary

Although blended learning has the potential to enhance the student experience, both in terms of engagement and flexibility, it can be difficult to effectively restructure existing courses. To achieve these goals for our introductory Pathology course, offered to more than 250 students in our Medical Science and Exercise Physiology programs, we devised a novel approach.

For each topic presented over 2-3 weeks, a single face-to-face overview lecture was retained. The remaining content that had previously been delivered as conventional lectures was converted into short (12-18 minute) online modules. These were based on lecture slides with added animations/highlights, plus narration using edited excerpts of previous lecture recordings. The modules also incorporated interactive questions and review quizzes with feedback which used various question types. Modules were developed in PowerPoint™ and iSpring Pro™, then uploaded to Moodle as SCORM packages. Each topic concluded with an interactive large-group session focusing on integration of the content, with in-class questions to which students could respond via the Echo360 Active Learning Platform (ALP). Overall, more than 50% of face-to-face lecture time was replaced by online modules and interactive large-group sessions. Quantitative evaluation data included usage statistics from 264 students and feedback via online survey responses from 41 students. Qualitative evaluation data consisted of reflective commentaries from 160 student ePortfolios, which were analysed to identify factors affecting learning benefits and user acceptability.

74% of students completed all the online modules (85% completed 90% or more of the modules) and on average, 83.1% of students eventually passed the optional review quizzes. Notably, 88.4% of students responded to in-class questions during the integration and feedback sessions via the ALP. Student reflections emphasised that the modules promoted understanding, which was reinforced through active learning. The modules were described as enjoyable, motivating and were appreciated for their flexibility, which enabled students to work at their own pace.

In transforming this introductory Pathology course, we have demonstrated a model for the use of blended learning in large group teaching sessions, which achieved high levels of completion, satisfaction and impact on learning.

Outcomes/deliverables:
- 29 interactive online modules
- 4 large-group, interactive teaching sessions.
- One research manuscript (Under review; BMC medical education)
- One accepted conference abstract (ANZAHPE, Adelaide, 2017)
4. Key stakeholders

Prof. Gary Velan – Project Lead
Dr Cristan Herebrt – Team Member
Prof. Rakesh K. Kumar – Team Member

5. Project objectives, approach and evaluation

This project aimed to develop a novel approach to radically transform the introductory Pathology course PATH2201, and in doing so to make it a demonstration course for the use of blended learning in large group teaching sessions.

Specifically, the project aimed to:

1. Develop/implement an approach for the use of blended learning in large group teaching
2. Create online modules to replace a proportion of face-to-face lectures
3. Re-purpose remaining in-class time for more interactive and engaging activities
4. Evaluate the effectiveness of our approach
Rationale
Blended learning is defined as a combination of traditional face-to-face learning with online content or other activities supported by information and communication technology. The rationale for blended learning is to engage students and enhance the learning process. Currently, there is an increasing drive to incorporate blended learning into higher education worldwide. However, there are multiple challenges to successful implementation of blended learning, particularly in large courses or courses with high information content. Simply supplementing face-to-face with online activities may be insufficient. Providing some of the content online may free remaining time during classroom sessions for impactful face-to-face interactions and other potentially engaging activities that reinforce and extend learning.

Summary of approach
We replaced more than 50% of the traditional lectures in PATH2201/2202 with online modules created using PowerPoint and iSpring Pro. Modules incorporated narration in the form of edited excerpts of previous lecture recordings, slides that included animations/highlights, plus questions and quizzes using several questions types. The remaining in-class time was dedicated to overview lectures and face-to-face technology-enhanced formative assessment sessions that provided progressive feedback and were more engaging.

Approach in detail
The course was delivered over 12 weeks in Semester 2, 2016. For the first 2 weeks, we retained the traditional lecture format to introduce key concepts. Thereafter, a consistent blended approach was applied to each of the 4 major topics (acute inflammation, chronic inflammation, vascular disease and neoplasia) addressed during the course.

For each topic, spanning 2-3 weeks, a single face-to-face overview lecture was retained. This lecture provided a broad overview of the topic, with key information and learning objectives. The lecture was recorded using the UNSW Echo360 (Reston, VA) system and made available via Moodle, the UNSW learning management system (LMS). The remaining content was provided as sets of short (12-18 minute) online modules. Modules were based on PowerPoint presentations previously used for full-length lectures, with narration in the form of edited excerpts of previous lecture recordings. The free software Audacity (Audacity Inc, Renton WA, version 2.0.6) was used to edit and enhance audio clips. The slides were enhanced with animations and highlights which were synchronised with the audio within iSpring Pro (version 8.3.1). In addition, the modules included links to additional online resources, interactive questions and review quizzes using multiple question types with feedback. Typically, each former 50-minute lecture was converted into a set of 3 modules which focussed on a pathological process (e.g. the immune response) or an example of a specific disease (e.g. acute appendicitis).

HTML5 modules, able to be viewed in a browser on any device, were generated from PowerPoint presentations using iSpring Pro and were uploaded to Moodle as SCORM packages. After the relevant overview lecture, students were given unrestricted access to all modules associated with the topic.

Importantly, the review quizzes within the modules provided students with immediate feedback after each attempt. Completion of the quizzes within each module was not compulsory, and there was no limit to the number of attempts permitted for each quiz, as the scores obtained did not count towards the overall course mark. However, the module was not marked complete within the LMS until students obtained a score of 80% or more for the review quiz. The last screen in each set of modules included a link to an online survey utilising the Perceived Utility of Learning Technologies Scale (PULTS) which had previously been developed and validated within the UNSW Faculty of Medicine's Blended Learning Project (Velan et al, unpublished). PULTS assesses factors that influence perceptions of and engagement with online learning resources, and is a valid and reliable method for evaluating online learning technologies.

Each topic within the course concluded with an interactive large group formative feedback session which focussed on integration of the topic content. These “integration and feedback sessions” used the Echo360 Active Learning Platform (ALP) to present in-class questions, including questions related to
relevant case studies, to which students could respond anonymously using their laptops, tablets or mobile phones. Immediate feedback was then provided by the lecturer, which was tailored to the overall class pattern of student responses.

Student scores from the integration/feedback sessions did not contribute to the overall course mark. However, to encourage engagement with these sessions, 5% of the overall course mark was awarded to students who responded to at least two-thirds of the questions in those sessions. To further promote engagement, these sessions were not recorded (unlike the overview lectures), thus the benefits could only be obtained by attendance in person.

**Evaluation**
Students’ engagement with the online modules was determined by data obtained from the SCORM packages in the LMS, and was reported as total attempts, completion rates as well as the average number of attempts for each student per module. Student satisfaction with the online modules was initially assessed using a PULTS survey at the end of each set of modules. Textual data was derived from NVivo analysis of commentaries recorded in student ePortfolios, in which they were asked to ‘reflect critically on the use of online modules for your learning in this course’.

**6. Project outcomes and deliverables**
We developed and successfully implemented a novel blended learning approach into the introductory Pathology course PATH2201/2202. We created 29 modules and 4 interactive, large-group teaching sessions (integration and feedback sessions), which were delivered to 264 Pathology students in Semester 2, 2016.

**Online modules**
By the completion of the course, 85% of enrolled students had completed 90% or more of the modules. For each module, the total number of attempts was considered to be a measure of usage. Initial usage was very high. For example, the first module was attempted a total of 1472 times (5.6 attempts per student). Based on the SCORM data for each of the modules, most students repeated the modules until they could achieve a pass score of at least 80% in the final review quizzes (Figure 1). The modules were eventually completed (i.e. review quiz was passed) by 83.1% of students, but on average 6.5% of students did not access each module.

![Module completion](image)

**Figure 1: Completion rates for all online modules**
Graph showing the percentage of enrolled students who by the end of the course had accessed the module and passed the review quiz, accessed the module but not passed the review quiz or had not accessed the modules.

**Integration and feedback sessions**
Student attendance at each of the face-to-face integration and feedback sessions was consistently high. Average attendance for the 4 large-group sessions was 88.4 ± 1.6%. In contrast, only 54.2% of the cohort attended an end-of-semester revision session for which engagement was not linked with the course marks (not shown).
Evaluation
The voluntary PULTS survey was completed by 41 students at the end of the first set of modules. Survey data indicated high overall student satisfaction with the online modules. Importantly, students agreed strongly that the modules provided “feedback that enhanced learning” and “an individualised learning environment” (Figure 2).

Thematic analysis of student ePortfolio reflections identified several positive attributes of the online modules which are summarised in Table 1. Thematic analysis also identified several potential problems with the modules. Convenience and flexibility came at a cost for some students who tended to procrastinate. Lack of personal interaction with individuals was often noted as one of the negative aspects of learning using the modules, due to the absence of much-valued social engagement and lack of opportunity to ask questions. Other less frequently cited concerns included a need for audio transcripts of the online modules and some difficulty streaming online content from off-campus internet connections.

![Appendicitis modules - responses](image)

Figure 2: Student engagement and satisfaction as indicated by the PULTS survey
Students indicated the extent to which they agreed with each of the statements by clicking on stars, with 0 indicating no agreement, and 6 indicating strong agreement. Data are median ± interquartile range, n=41.

In this project, we have developed and implemented a novel approach for incorporating blended learning into the large introductory Pathology course, PATH2201/2202. Our approach enabled us to successfully incorporate blended learning into an existing course, while taking full advantage of previous resources and maintaining the strengths of the course in its previous form. We observed a very high level of usage of the new online modules as well as significant engagement from students during face-to-face integration and feedback sessions. Importantly, we believe this approach is likely to be applicable to other large-group courses.

Additional outcomes:
A manuscript describing the results from this project has been submitted for publication in BMC medical education (under review). In addition, a related conference abstract has been accepted for presentation at the annual meeting of the Australian and New Zealand Association for Health Professional Educators in Adelaide (ANZAHPE, Adelaide, 2017).

7. Sustainability of outcomes
Outcomes from this project will be sustained after the completion of this project. The approach will be retained in PATH2201/2202 in 2017 and beyond. In addition, aspects of the blended learning approach developed in this project have also been adopted in other Pathology courses (e.g. PATH3205).
Analysis of feedback received during the project and from the end-of-course evaluations identified many ways in which our approach to blended learning could be improved. In 2017, most of the remaining budget was used to implement many of these enhancements. Specifically, PDF transcripts for each module were made available and additional quizzes were created so that each of the 29 modules contained a review quiz. In addition, the audio for several modules was re-recorded and 6 modules were extensively rebuilt to improve the overall clarity of the content. These improvements, should ensure an even better experience for students studying Path2201/2202 in semester 2, 2017.

The modules developed during this project will also be a valuable resource for future Pathology teaching at UNSW. Furthermore, the development of online content for this project is a significant step toward the creation of a fully online Pathology course which could be offered via the PLUS Alliance.

8. Evaluation of Outcomes

Challenges, Lessons learnt and recommendations
Below is a summary of the major challenges encountered as well as recommendations for addressing these challenges in future projects.

1) Development of engaging interactive online content was extremely labour intensive.
We estimate that each 12-18-minute module took approximately 20 hours to develop and test. The 29 modules we developed in this project took approximately 600 hours to complete. Therefore, we believe it is important to ensure that similar projects involve a team of people. We used several casual staff to assist with time-consuming tasks (e.g. editing of lecture recordings), but it is also critical to engage people with appropriate skills. It is also important to have clear aims and to allow enough time to complete the tasks.

2) Selecting the optimal software for development of online content is difficult.
Many different software packages are available, and it is important to understand the advantages and limitations before making a selection. We chose to use iSpring Pro because this software has full PowerPoint integration, excellent user control of playback and easy intercalation of quizzes. The software can also generate HTML5 modules which can be viewed in a browser on any device.

3) It is extremely challenging to develop an approach that is appreciated by all.
Although most students appreciated the online modules and the flexibility they offered, many were also disappointed that there were fewer opportunities to interact with academic staff. Some students found it difficult to manage their time, and an average of 6.5% of students did not attempt each module.

The review quizzes were the most regularly cited elements of the modules that led to deeper understanding of the material. The interactivity stimulated active learning processes which aided concentration and retention of knowledge. Many students suggested that there should be even more questions.

Flexibility also promoted student satisfaction, enabling students to complete the modules at their own pace at convenient times and locations. However, some students admitted that this flexibility increased the likelihood of them falling behind. To address this, we linked the online modules to a progress bar in Moodle to remind students to complete the online content. We recommend that academic staff closely monitor student progress and encourage students to complete the online content. This can be done during face-to-face classes or via posts on Moodle. It is also important that staff highlight other opportunities where students can ask questions and interact with academic staff, including Moodle forums, practical classes and tutorials.
11. Appendix A

Table 1: Positive aspects of the online modules identified from thematic analysis of student ePortfolio reflections.

<table>
<thead>
<tr>
<th>Identified theme</th>
<th>Representative student reflection</th>
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<tbody>
<tr>
<td>Promoting understanding</td>
<td>“In addition to the normal lectures provided, online modules bring together and make sense of newly taught information”</td>
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<tr>
<td>Promoting deeper learning</td>
<td>“Having online modules as opposed to traditional lectures forces students to embrace independent learning and allows us to develop the skills of ‘how to learn’.”</td>
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<tr>
<td>Motivation</td>
<td>“I was motivated to complete these modules because it was quick to go through and I thoroughly enjoyed the audio recording alongside with slides. The imagery was very intriguing and this was reflected in my motivation to perform well.”</td>
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<tr>
<td>Identifying priorities</td>
<td>“With the amount of information covered in lectures, I sometimes struggle identifying whether certain parts are important or not... However, the online modules allow me to prioritise which parts of the topic are required whilst providing a good amount of detail.”</td>
</tr>
<tr>
<td>Efficiency</td>
<td>“The information in the slides was concise and very well structured making the process of studying the course very efficient.”</td>
</tr>
<tr>
<td>Flexibility</td>
<td>“...to my rescue come the online modules, which can be done when and if I am ready to learn, usually on a Sunday afternoon in the sun.”</td>
</tr>
<tr>
<td>Navigation</td>
<td>“I enjoy that I’m able to pause throughout the modules because it gives me plenty of time to understand and take notes, rather than in a lecture where I feel I miss things because I sometimes struggle to keep up with note taking.”</td>
</tr>
<tr>
<td>Feedback</td>
<td>“The quizzes can be hard, but they provide really good feedback on how I’m actually going and whether I’ve critically understood what was presented to me.”</td>
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<tr>
<td>Individualisation</td>
<td>“I think having a variety of mediums where the same information is presented to us, whether it be the tutorials, macro pathology labs or online modules, has given me choices to suit my study habits and study needs, but also helped me experiment with the learning style I am most accustomed to.”</td>
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