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E-Enhancement of Existing Courses: Is it Worth it?

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BACKGROUND
Blended learning is an approach that recognises that a combination of teaching techniques (face-to-face, on-line and mobile) can be a very effective way to share knowledge with today's students using today's technology. This paper introduces two case studies in Civil Engineering and Computer Science for a move to blended learning through the electronic enhancement (e-enhancement) of learning materials in well-established courses. This initiative is evidence-based and combines both quantitative and qualitative measures to evaluate the effectiveness of the learning and teaching (L&T) strategies implemented in the existing courses on both students and staff.

PURPOSE
Given that there are so many ways to update and enhance a course, is it worth the effort to move to blended learning and, if so, how can we justify the investment of time and resources?

DESIGN/METHOD
Two courses, a first year course in Civil Engineering and a third year course in Computer Science, were selected for enhancement and different strategies were used, including on-line materials, podcasting, rapid feedback and game-based learning, to move to a blended learning environment. We chose to monitor a set of key indicators: ongoing participation after increased electronic delivery and lecture recording, student engagement and academic performance, as resistance to blended learning often revolves around issues of reductions in lecture attendance, student engagement and academic rigour and quality. These were assessed through surveys, student outcomes, participation and self-evaluation to assess the overall impacts. The staff involved in the process also monitored their own time to assess the influence on their own workload. The assessment and analysis was carried out through both qualitative and quantitative assessment mechanisms.

RESULTS
Students found the new electronic L&T materials and approach to be engaging, useful and a desirable alternative to existing materials, with strong evidence that the materials were used extensively throughout the course and in the lead-up to examinations. Student performance either improved or remained at the same level, however student satisfaction increased overall in all offerings. Staff noted that the initial investment of effort, while greater than usual, resulted in no additional time investment over the entirety of the course. Most importantly, the availability of blended learning materials had no significant impact on lecture attendance and, for the greater majority of students, was not seen as a reason to miss lectures.

CONCLUSIONS
A move to a blended learning approach is desirable for a large number of courses as it allows academics to maintain pedagogical standards while increasing student satisfaction and has no significant increase in academic workload over time. However, in general, transitional support and training for staff are vital to this success, as there is an initial burden in discovering techniques that work and having the underlying support resources to achieve this success.

KEYWORDS
electronic enhancement, educational problem, on-line learning, blended learning, workload management, student satisfaction.

INTRODUCTION

Blended learning is, in many ways, a challenging area, as it is still in its relative infancy, with key concepts difficult to specifically define (Chew *et al*, 2010). Combining the technological with the pedagogical causes confusion in terminology (what do we mean by a technology in this space?) as well as risking the weakening of the pure theoretical basis of the pedagogy. To some, electronic learning (e-learning) is web-based learning, to others, rich and diverse interactive tools. Whichever approach is taken, wherever there is integration of face-to-face and online delivery methods, we are employing blended learning (Partridge *et al*, 2011), but debates over composition, and hence what these courses even look like, continue. What we can agree on is that technology can be a way to improve the efficient use of resources, whether by increasing the utilisation of staff time through on-line course aspects to a marked increase in the perceived flexibility in student options (Welker and Berardino, 2005). Given these findings that, among other benefits, the quality of writing improved and grades held steady or improved, there is a perceived resistance to adopting blended learning, with staff fearful of additional time investment, for little perceived benefit, or the often expressed concern that students will not come to lectures.

While many education institutions have developed initiatives to implement a blended learning approach, questions remain as to the efficacy of such approaches and the return on invested effort. Despite the presence in the literature of the positive impact of blended learning, implementation is still stymied by this established faculty resistance. In this paper we present the authors' experience with a University sponsored electronic enhancement project, over two courses, and discuss the lessons learned. This includes positive and negative impacts on student learning objectives and the overall student experience. This paper discusses the outcomes of this project in the disciplines of Computer Science and Civil Engineering. The courses have significantly different characteristics with respect to year level, class size and technological approach, but both ultimately adopted a similar electronic learning and teaching (L&T) strategy that was versatile enough to accommodate the different pedagogical challenges.

The final year Computer Science course, *Computer Networks and Applications* (CNA), introduces students to networks and digital communications, with a focus on Internet protocols. Most students are likely to have had little prior exposure to these concepts and hence the course has no assumed knowledge. As a result, this limits the depth of understanding that can be developed in the lecture time available. The first year Civil Engineering course, *Engineering Mechanics: Statics* (EMS), has a large class size of approximately 550 students. Therefore, it has traditionally suffered from the student perception of inadequate feedback. In addition, it is a critical course with its curriculum scaffolding within the course, and also throughout the degree program, hence a strong understanding of its key concepts is essential for students.

To be useful in a time-poor academic's teaching plan, any electronic L&T enhancements should benefit the student learning environment, while managing the academic workload in the long term. Thus, we assess a number of performance metrics and associate these with each course to show that, overall, student learning and teaching indicators generally improved. More importantly, the time invested in the project has continued to save effort as the courses progress, ameliorating the initial investment of time while increasing student learning and satisfaction.

TEACHING STRATEGY

To address the pedagogical issues of the two courses, it was necessary to ensure that the proposed electronic L&T strategies were able to achieve the effective and timely teaching of key concepts, and support additional formative feedback to students. This was done through the online delivery of video modules, such as podcasts, to summarise key concepts. For the two courses, while their characteristics were different, the overall teaching strategy was consistent and aimed to use podcasts to introduce key concepts in a pre-lecture environment. This then allowed the transformation of the traditional face-to-face didactic lecture into an interactive workshop atmosphere with integrated formative assessment for improved student feedback.

Pre-lecture electronic delivery systems allow independent student study in an 'anywhere any time' approach (Twigg, 2003). In addition, much like post-lecture recordings, they can provide benefits for lecture revision and distance learning, while giving a safety net if face-to-face sessions are unavoidably missed, however they are negatively perceived by many academics due to their potential impact on lecture attendance (McCredden and Baldock, 2009). When creating new L&T resources, such as podcasts, there is a corresponding increase in teaching workload and potential cost if new technology is required. Hence it is essential to ensure the efficient development of such resources, while considering the risk of how significantly they may affect student understanding. For this study, two case studies are presented with the objective of maximising student learning while minimising the impact on teacher workload.

CASE STUDY 1: COMPUTER NETWORKS AND APPLICATIONS

The field of Networking and Communications is of growing importance in the field of Computer Science (CS) Education, due to the increasing dependency on networked and distributed systems, and the near ubiquity of mobile devices. The ACM/IEEE Computer Science Curriculum 2008 (Cassellet al, 2008) defined core and elective networking components in the Net-Centric Knowledge Area (KA), identifying the importance of this topic by allocating it one of only 14 KAs, and this focus has been emphasised in the 2013 ACM Strawman curriculum as well (Sahami et al, 2012). The Net-Centric KA consisted of 15 hours of core material, to be taught in any CS degree, as well as a range of electives. As always, the addition of more core and elective hours into an area requires lecturing staff to manage the additional content and KA hours, without losing any other important material or running out of student contact hours. The core delivery module for net-centric computing is the third year course, Computer Networks and Applications (CNA).

CNA has approximately 120 students and was chosen for the e-enhancement project due to its existing use of web resources, including online recordings and notes, and network laboratories with associated quizzes. Electronic delivery mechanisms have been used in CNA for several years and the course is one of the heaviest users of electronic delivery in its School. However, the inclusion within the project provided an opportunity to explore alternative content delivery mechanisms to potentially improve student satisfaction, retention and understanding of key concepts. The project also provided the opportunity to increase elective coverage from CS2008 Net-Centric Computing without causing a large increase in preparation or contact hours. This was achieved by providing a series of preparatory materials that developed student understanding of network management issues, culminating in a formative assessment exercise to allow students to gauge their comprehension while actively problem solving in a game-like framework. This extended existing work within the CS2008 NC/Network Management elective to address overview of the issues of network management, issues for Internet Service Providers and quality of service issues.

The course was augmented in 2009 with the design and development of a range of pre-lecture podcasts and associated quiz materials to support a new content delivery model. Instead of using lectures for content delivery, all core material was presented in the podcasts and face-to-face sessions were used for content clarification and the discussion of detailed worked examples. Each podcast comprised approximately 15 minutes of traditional course content and concluded with a two-minute section discussing industry matters, ethics or other content relating to professional development. The podcasts were offered in a variety of multimedia formats to support a range of mobile devices and viewing platforms including Adobe Presenter (Flash), Audiobook and MP3.

The pre-lecture quizzes were formative assessment and included several questions that required an understanding of the podcast material. Depending on the question, the feedback for an incorrect answer was a detailed explanation of additional information to consider or a hint to guide the student on the right track. Each face-to-face session was associated with one or two podcasts, which were assumed knowledge for the face-to-face session that had the following general format:

i. brief review of material from the previous face-to-face session, with two or three questions to students.
ii. brief summary of the relevant course content delivered electronically.
iii. presentation and development of a collaborative activity or extended example.
iv. test (formative assessment) with a small set of questions to monitor student understanding.

To augment the existing course, taking advantage of the new delivery mechanisms, and extend the coverage of CS2008 Net-Centric Computing, additional electronic L&T resources included audio interviews with industry members and a vocational experience simulator in the form of a 'Choose Your Own Adventure' (CYOA) style website. The industry interviews provided a *real world* grounding that would normally require students and industry collaborator to be in the same lecture theatre or, even if recordings were made available, the students would listen to a very one-sided discussion. By analysing student comments and feedback over the previous three offerings of the course, an interview format was constructed that examined recent developments in networking, such as the transition to IPv6, and the industry collaborators provided their feedback and insight. This link to existing industry participants provides an authentic grounding for students.

In "Reality is Broken", McGonigal (2011) asks why people expend large amounts of effort, investing vast quantities of time, into game frameworks, even when those games are similar in many ways to their own jobs. Our challenge, in presenting additional course content, was to provide motivation for the students to study the material in the first place and then reward them for their participation. We selected a two-stage system that allowed us to introduce knowledge where simple right/wrong answers were often not available and then allow for a self-assessment and participation mechanism that allowed students to obtain the reward by solving a problem in a game-like context.

The additional network management material was presented to students as two minute podcast presentations, located at the end of the podcasts. These were cast as lighter, and non-core, to allow students to relate to the material in a different way. Each mini-podcast contained a discussion of real situations, or lessons learned from network management issues, and were self-contained. Following the podcasts, the students were able to voluntarily participate in a web-based activity, which introduced students to situations they may encounter in professional practice and was based on the lessons contained in the audio recording. The CYOA site presented a network debugging scenario that required students to draw on their own knowledge, and the content delivered in the podcasts. Due to the open-ended nature of the material and the scenarios, no assessment was carried out in this area and this was clearly indicated to students at the outset.

The format chosen was deliberately light-hearted and drew on the heritage of low-resolution graphic-based computer games to provide a nostalgic view that would appeal to a wide range of participants. The scenario that the students explored required them to undertake systematic fault-finding, address client concerns, identify systematic faults in their own preparation and, at any stage, backtrack and change their previous actions to see a new outcome. This illustrated a key point in our inclusion of this material, in that by choosing to make the participation in the CYOA a *formative* experience, we were able to be far more free-form in the way that control flow was managed and did not have to handle the implications of double mark entry, or a student inflating their mark by backtracking and choice alteration. This also encouraged side-effect free exploration of all of the scenarios. On completion of the exercise, students received a number of coded keys that could be entered into another portal to provide the course coordinators with a measure of progress through the activity, in terms of depth of progress, and provided the students with additional feedback, to cap their participatory activity.

CASE STUDY 2: ENGINEERING MECHANICS: STATICS

Engineering Mechanics: Statics (EMS) represents the basis of the civil and structural engineering degrees and has approximately 550 first year students. As is common in teaching such large classes (Iaria and Hubball, 2008), the course had difficulties in engaging student interest and facilitating interaction. Prior to entering the project in 2011, the course was inherited from another academic in 2007, along with some major problems relating to student performance: average grade of 47%; failure rate of 32%; and student perception of adequate feedback of 18%.

In response to these statistics, the lecture format was supplemented in 2007 through the provision of an opening address that summarised key concepts from the previous lecture while introducing the new ideas that students would encounter in the current lecture, and an explanation of the relationships between them. Student reaction demonstrated that this bridging exercise, dubbed a *crash course*, clearly assisted with student understanding. This strategy became the first step in a transformation of the traditional didactic lecture into an interactive workshop atmosphere, and is discussed in detail in (Willis, 2011). Key elements are summarised here for completeness.

As a first year class, the course had a wide diversity of student backgrounds and assumed background knowledge. Hence this variation in student ability necessitated an approach to ensure that all students had the opportunity to develop a similar level of threshold understanding of key concepts prior to the presentation and discussion of more complex course material. This was exacerbated by the volume of students with English as another language that may have had problems in developing the new technical vocabulary of the course material in addition to the theory. If this assumed knowledge was deficient, then individual engagement would be low.

As a result the use of crash courses formed an integral part of the learning process, and had the following steps that distinguished the face-to-face session from a traditional didactic lecture:

1. Summarise key concepts, avoiding jargon so students can develop their vocabulary with time. Model the problem solving process (e.g. using a document camera) rather than simply dictate lecture material.
2. Highlight links between topics as part of the scaffolding curriculum so that students can envisage it as a continuous learning experience not simply as isolated modules of theory.
3. Incorporate formative assessment as multiple choice questions (MCQs) to test key concepts. This provides timely and meaningful feedback to students along with feedback to the lecturer to monitor student understanding.

For assessment to be formative, feedback must be as immediate as possible. The lecture slides included short MCQs that students attempted to answer as they appeared on screen, and, as part of this process, were required to explain the reasons for their answers to the student(s) next to them. Compared to previous cohorts who did not engage in this peer instruction (e.g. Mazur, 1997), the answers among the students more commonly converged on the correct one as indicated by show of hands. This process gave formative feedback to students on their performance and, equally importantly, gave the lecturer feedback as student understanding was able to be surveyed and any shortcomings in student learning subsequently addressed.

This interactive workshop style of teaching and learning might normally be reserved for tutorial sizes of 30 students rather than a lecture theatre full of hundreds of first years. But the introduction of key concepts via crash courses at the start of each lecture primed the class to actively participate in the learning experience. Students were given opportunities to continually test their understanding of key concepts and their problem solving skills by completing both short MCQs along with long fully worked problems. Students could then both acquire and demonstrate their understanding before leaving the lecture theatre, which is imperative for an engineering curriculum, which must build knowledge, competence and confidence in interconnected and scaffolded steps.

As part of the project, in 2011, the crash courses were taken a step further and put online as video crash courses to cater for diversity in student learning needs. This was done by simply extracting the crash course component (i.e. the concise explanation of key concepts using the document camera, rather than lecture slides) of the lecture recordings made during the course offering in 2010 and making these available as separate files for each course topic. These video modules were available as preparation before lectures and as revision tools. In a normal semester, the entire Statics course has 36 hours of lectures, whereas the video crash courses summarise all the key concepts in two to three hours. Although the video crash courses were made available in the 2011 course offering, the face-to-face sessions were conducted in exactly the same format as previous years, as described above. In effect, the video crash courses were simply deemed as supplementary learning resources, and there was no additional incentive given to students to view them such as summative assessment for participation.

IMPACT ON STUDENT LEARNING

The effectiveness of each of the e-learning strategies on the student experience was measured with respect to student outcomes and their perceptions of its impacts on student learning.

CASE STUDY 1: COMPUTER NETWORKS AND APPLICATIONS

A custom survey was developed in 2009 to measure student perceptions of the new e-learning resources. This was in addition to the standard university course survey last conducted in 2007. Each survey used a 7-point Likert scale with responses of 1 and 7 indicating strong disagreement and strong agreement, respectively. With a response of 4 representing neither agreement nor disagreement, the summation of responses 5-7 is therefore denoted the level of 'broad agreement' with each survey question. The 2007 offering had 128 students, with 57 completing the survey (45%) and, in 2009, 105 students, with 38 responding (36%). The major differences in results for questions common to both survey sets between 2009 and 2007 were:

i. Overall workload rating increased from 65 to 82% (broad agreement).
ii. Satisfaction with quality increased from 82 to 89%.
iii. Stimulation of enthusiasm increased from 70 to 87%.
iv. Clear expectations increased from 77 to 82%.

The student responses for the project survey questions are shown in Table 1, indicating the positive influence on student understanding and resources for revision. The electronic materials also received significant praise in students' comments on the best aspect of the course, with students noting convenience and ability to further develop understanding in particular. This survey had the 2009 participation rate of 36%.

Table 1: Summary of project survey questions.

	Survey Question	Broad agreement (%)
1	I prefer the electronic content delivery model compared to traditional lectures	87
2	I would like to see more courses adopt this electronic content delivery model	76
3	The e-learning materials improved my understanding of the course material	87
4	The e-learning materials reduced my lecture attendance	37
5	The e-learning materials will be used as part of my exam revision	92

In addition to the above surveys conducted at the conclusion of the course, questionnaires were provided to students at the end of each week during the teaching period to record their perceptions of the material and allow them to provide feedback to teaching staff. Early feedback indicated that students found the podcasts useful and enjoyable, and that they used the pre-lecture quizzes in conjunction with the podcasts to test their understanding. The majority of students (90%) accessed the podcast materials at home, with use while commuting was the next most common access method. An overall survey was also provided once students had reviewed the material, to capture those students who did not access all material on a weekly basis, with results including:

i. For the efficacy of the delivery of course content, on a scale of 1 to 5 (poor to excellent), the standard lectures were rated 3.8 and the e-enhanced lectures were rated 4.2.
ii. 80% of students had used the materials for pre-lecture review or self-testing.
iii. 65% of students were actively using the materials for revision.
iv. Only 9% of students claimed they had used the podcast as a replacement to attending the lecture.
v. Students commented that despite the additional pre-lecture time required, the extra effort was worth it. However, students indicated that it was sometimes hard to find the time to go through the material but that it made exam preparation more efficient. Students also requested that all materials were made available much earlier in the semester (podcasts were generally available a week to four days before the lecture.)

As indicated, there was not broad agreement that the e-learning materials significantly affected lecture attendance. In follow-up questioning and analysis of those students who were not attending, those students who did not attend were, in over 80% of cases, not planning to attend regardless of the material delivery format. Reasons for non-attendance included conflicting work schedules, distance to travel for early scheduled lectures, and, in the case where students did not attend, failed to respond to interaction requests and did not submit any assessment, representing complete disengagement from the course prior to the delivery of e-learning materials.

In addition, the failure rate remained relatively consistent between 2008 and 2011 at 16, 16, 18 and 11%, respectively. This demonstrates that the transition to a greater amount of course content in an electronic format, with a corresponding reduction in lecture time spent on content delivery has not had a negative effect on overall student performance. In terms of participation, voluntary engagement with the optional CYOA exercise was high, with over 50% of students who used the podcast material going on to complete the CYOA assignment. There has been no significant change in average grade point average (GPA) for the course, with respective GPAs (out of 7) as 4.36, 4.38 and 4.50 between 2009 and 2011.

CASE STUDY 2: ENGINEERING MECHANICS: STATICS

Prior to the e-enhancement project, instant feedback in class through constant peer and teacher interaction has had some astounding effects on key student outcomes over the span of only two years. Between 2008 and 2010, the average grade increased from 47% to 72%; the failure rate decreased from 32% to 5%; and student perception of adequate feedback increased from 18% to 81%. The latter response was particularly significant in that, despite students receiving no written feedback on any assessment (as even summative tests were multiple choice and marked electronically), the integration of formative feedback into lectures reformed student perceptions. In addition, a special survey asked if crash courses improve understanding of lecture material, and received 98% broad agreement. Building on the positive results of the crash courses being integrated in lectures, the student perceptions of the video crash courses introduced in 2011 (as voluntary supplementary learning materials) were also investigated. The results of a special survey regarding video crash courses are given in Table 2. This survey was given to a class of 550 students, with a response rate of 55% (305 students).

Table 2: Student perceptions of video crash courses.

	Survey Question	Broad Agreement (%)
1	Video crash courses help me understand key concepts.	86
2	Video crash courses help me understand new terminology.	79
3	Video crash courses help me understand the links between different topics.	76
4	Video crash courses increase my engagement during lectures.	64
5	Video crash courses encourage me to attend lectures.	47
6	Video crash courses prepare me for lectures.	64
7	Video crash courses appeal to the way I learn.	81
8	I use video crash courses as a revision tool.	81

From questions 1 and 8, the positive responses were as expected, because the video crash courses represent concise summaries of the key concepts, the students perceived that they helped them understand the course material and assisted with revision. Conversely, question 5 did not have a very positive response, however to clarify this, informal conversations with students indicated that students would attend anyway due to the interactive workshop style of the face-to-face sessions, not necessarily just because of the video crash courses. It is difficult to interpret such results as there are typically numerous complex factors influencing student behaviour relating to lecture attendance. However, attendance was consistently high, at approximately 80-85% throughout the semester, which is of particular significance given that it is for a large first year cohort. All other survey responses were generally very positive with students, especially question 7 revealing that having students greatly appreciated the 'anywhere, anytime' availability of the video crash courses in such a concise and controllable format. The effectiveness of this teaching strategy was further demonstrated by the following student testimonial:

> *The video crash courses have been invaluable this semester for consolidating my learning after lectures and in preparation for tests and the exam. They offer a succinct overview of each topic in the course that forms a strong framework to build upon in the lectures. They are incredibly useful as a method to review past lecture material or to get a head start on a topic and go into further detail in the lectures. The crash courses allow the topic to be presented in a relatively short amount of time, allowing extra time for further in-depth discussions and relevant examples. The use of the crash courses followed by these examples allow me to gain a much deeper understanding of each topic.*

FINDINGS AND IMPLICATIONS

The positive results of the two case studies included in the e-enhancement project reflect those given in the literature. That is, effective and appropriate use of blended learning has the potential to greatly improve student outcomes and has the advantage of increased flexibility of learning for students. However, in the current economic climate for higher education in Australia, the long term efficiency in staff time usage is essential. With this in mind, having initially produced theses electronic L&T resources, they are able to be used repeatedly in subsequent course offerings, thus greatly reducing the corresponding academic workload. Removing the obstacle of fear due to uncertainty for early adopters of lecture technology by presenting the benefits of such approaches is also critical as we wish to provide a high quality student experience that is consistent across teaching environments. The following factors were important contributors to the success of the current project.

1. Lecture attendance. For Computer Science, student lecture attendance remained constant throughout the course component that used podcasts. Furthermore, student participation improved compared to 2007 and 2008, with 97% of eligible students undertaking the final assignment and 100% of eligible students attending the final examination. For Civil Engineering, lecture attendance remained high at around 80-85% for course offerings with and without the e-learning resources. In fact, many students used the L&T materials as preparation for lectures and assistance with learning new terminology prior to lectures.

2. Student workload. Due to the inclusion of the e-learning resources, students were able to review material easily and reconnect with the course if they had to disengage temporarily. Although some students indicated that they perceived the inclusion of pre-lecture preparation as additional workload in the short term, it was widely agreed that in the long term this was greatly beneficial to their overall understanding of the course content. It was important for teaching staff to discuss with students the amount of time they are expected to spend on a course as part of independent learning, that is outside of scheduled face-to-face sessions.

3. Staff workload. One of the most important results of the e-enhancement project, was that the workload of the authors did not increase overall. An essential component of this was the planned re-use of the e-learning resources in subsequent offerings of the course, and in other related courses where the key concepts would be assumed knowledge due to scaffolding curriculum across the degree program. For Computer Science, the lecturer spent, on average, one hour per lecture recording audio for the podcast, notating slides, developing new lecture activities and preparing quizzes. However, this preparation time also allowed the review of the lecture material, as would normally occur prior to delivering the lecture. As the format of the lecture changed from content delivery to revision, review and understanding, less preparatory time was required for the lectures. For Civil Engineering, as the e-learning resources were simply extracted from existing lecture recordings, there was essentially no increase in workload in the short term (related to preparation of new materials) and a marked decrease in workload relating to repetition of teaching key concepts.

4. Participation. The success of any new teaching strategy can be reflected in the level of participation of the students. For Computer Science, as stated above, students indicated that while such a strategy increased their workload in the short term, it was reduced in the long term as examination preparation was more efficient but these students also requested that all video modules be available all the time from the start of semester (i.e. not released on a time delay basis). This has an impact on the pedagogy of the strategy as any Socratic features of the lecture, where face-to-face consideration was to be carried out, would have to be concealed from the pre-released slides. Small podcast episodes were considered as bonus learning material, which allowed for emphasis by repetition within the material presented in face-to-face lecture. For Civil Engineering, the e-learning resources were voluntary, however they were kept as relatively short and concise summaries. Therefore, although they were not related to any assessment, the incentive for students was that they could receive a *head start* on the lecture with a small investment of time.

SUMMARY

This project has highlighted that blended learning can allow for an engaging student experience as they are better prepared for the face-to-face session, rather than a traditional lecture with far lower information retention characteristics. Although the two courses discussed in this paper had very different attributes, the characteristics of the pre-lecture activity were common. The aim was to prepare students for the face-to-face session by instilling them with confidence in the course material. This allowed the format of the face-to-face session to be transformed from a passive didactic lecture to an interactive workshop atmosphere where students could actively participate and practice their problem solving skills. A key component of this was the inclusion of MCQs to provide formative feedback to students and inform the lecturer of student progress. These case studies may be most effective where the students have a relatively clean slate of their assumed knowledge with varying educational backgrounds (e.g. Level I for EMS, and no assumed knowledge for CNA). The effectiveness of this project was demonstrated by increased student engagement and interaction, along with either positive or neutral impacts on student outcomes such as average grades and failure rates.

When we ask "Is it worth it?" of our enhancements, we have to consider the impact on ourselves and our students. The impact on the students surveyed is positive and, so, from that perspective, the answer is "Yes". In terms of the effort involved, both authors have gained a great deal from the re-use of the developed material, which has more than rewarded the original investment of time. However, the investment of time up front can appear intimidating but, if staff can make this time and can then go on to re-use this developed and enhanced content, then (again) the answer to "Is it worth it?" is "Yes".

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