An assessment of online instruction vs. blended learning for an undergraduate Business Decision Making Course

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ABSTRACT

With the advent of laptop technology, the conventional classroom delivery of an introductory class to quantitative decision making has to be re-evaluated. Two distinct forms of instruction are presented: a) completely online delivery in which there is no face-to-face interaction between the instructor and the students, and b) a blended approach in which weekly interaction is supplemented with the use of non-intrusive recorded lectures. Using the same course material and content, the author has piloted both forms of instruction and the feedback from students has been varied. For the online mode, students found the course intensive, fast paced and only the extremely dedicated and self-motivated students completed the course successfully. The recordings were found to be an essential part of the learning experience. For the blended mode, where recorded lectures were optional, students reported that the recordings enhanced their learning experience and improved their confidence in the material being mastered.

For both forms of instruction, an electronic homework delivery system was used. The homework system was found to be popular and re-enforced the material being taught. In addition, a strong correlation was observed between course grade and average homework grade for both the online and the blended model.

Keywords

E-learning, Blended Learning, Web-based Learning

1 INTRODUCTION

In the past, a typical learning model involved students solving assigned problems manually (utilizing the formulas introduced during the lecture period). These problems would be submitted to the instructor who would hand-grade them and return them to students as soon as possible. With the advent of computer technology, this model needs to be re-evaluated, [Lohr2009]. Two approaches have recently emerged, blended learning vs. completely online delivery. [Burrell-Ihlow2009] provides a case study of an implementation of a blended learning course. [Verkroost et al 2008] and [Tang and Byrne2007] describe the advantages of blended learning vs online learning and found mainly that students appeared more satisfied with the blended learning model. A detailed summary of the literature on of the benefits of blended courses for a clinical laboratory science class can be found in [Mccown, 2010].

Some universities are moving towards delivering such courses in an online mode but research has demonstrated that students benefit from regular student/instructor interaction [Kruse10]. The research in [Rayner10] highlighted significant differences between the performance of the e-learning and face-to-face groups with e-learning students performing poorly when compared to their face-to-face peers. When considering how classroom-delivered courses should be integrated as online courses, the authors in [Smart06] found that this integration should be carefully planned based on learner characteristics, course content, and the learning context. In dealing with a quantitative business class, this is particularly important: students require interaction with the instructor in order to master the required learning goals.

In this paper, the authors provide a quantitative analysis to two approaches of classroom instruction. In each approach, the identical course content is delivered. We first describe a blended model in which conventional classroom instruction takes place bi-weekly, yet the material is re-enforced via web-based learning methods such as recorded lectures and online homework. We then describe a completely online version of instruction in which the same course content is delivered exclusively via the Internet with no face-to-face interaction.

Both forms of instruction described in this paper benefit from two teaching innovations, first the use of non-intrusive recorded lectures in which the entire lecture including all key strokes, screens and sound is recorded during a conventional class. The lecture is then processed and an

integrated multimedia file is posted to Blackboard after class. Students benefit from being able to review the class in a self-paced manner. The second innovation is the use of electronic homework tests which are posted via Blackboard and graded automatically.

The paper is organized as follows. In Section 2 we describe the recorded lecture innovation and compare the feedback obtained from students who were required to use the facility (online mode) vs. those who used it in an optional manner (blended mode). In Section 3, we discuss the advantages and disadvantages of the electronic homework mechanism and demonstrate the results from both groups (blended and online) who participated in the experiment. The results of the online group are limited to a single pilot run (Summer 2010, where the course was delivered in an accelerated mode over five weeks in the summer), whereas for the blended group we report on three sections, two from Fall 2010 and one from Spring 2011. The blended course sections each ran over a semester long, thirteen week schedule. In Section 4 we provide conclusions and recommendations.

2 RECORDED LECTURES

During the course of our teaching of this quantitative methods class, we have found that students are on the whole interested in using their computers to achieve success in their learning. The main challenge in a quantitative methods course is catering for an extremely mixed audience. While some students are technically savvy, others lack some basic skills. This study attempts to bridge this gap by developing a toolbox of learning objects which will cater to these needs by providing continuous support and feedback and simultaneously challenging the stronger student.

In a quantitative methods class, students are capable of absorbing the concepts presented during the lecture, but fail to comprehend the Excel methods required in order to analyze the data. This deficiency can easily be overcome by providing additional resources in the form of interactive learning objects which can be viewed in a self-paced manner outside the class. Students find that watching an interactive example at their own pace is more beneficial than reading through a printed handout explaining the steps.

We use Camtasia [ref] software to record the lecture including all screens and keystrokes used as part of the concept being taught. For each topic, a series of labeled examples are created for the student to download, view and listen to in his/her time. Moreover, it is possible for the student to self-pace the work by fast-forwarding to a problem area he/she faces or by repeating aspects of the example that require further understanding. The advantage of the recording is that students can pause the example and try the problem themselves with the aid of the interactive tutor.

As an example, consider a Forecasting problem which involves a sequence of steps which include graphical presentation of the data, regression modeling and dealing with seasonality in the data. During a class, students are often overwhelmed by the complexity of the stages involved and lose track of the end goal which is to produce a reliable forecast. Confusion sets in as a result of missing a single link in the chain of events leading to the forecasts. By recording the forecasting example, the student can re-create the Excel model, and use the interactive learning object to clarify the material by listening to the instruction and applying the step-by-step methods in their own time.

2.1 Results from the pilot study

2.1.1 Online Group

The recorded lectures for the online group represented a crucial form of the delivery of this course. Free form comments regarding the use of recorded lectures are summarized below:

- “I liked the Camtasia recordings, but would have preferred an instructor led course”,
- “I liked the online format and the Camtasia recordings for review really helped me understand the material”.
- “I liked the Camtasia recordings. I don't think I could have passed the course without them as this was an online class”.
- “These recordings are crucial in an online course such as this one”.
- “I liked having the recording of all the lectures available”
- “I was very happy with the Camtasia recordings and loved that I had the lecture in order to learn the material”

In contrast to the positive feedback on the Camtasia recordings, most of the freeform comments (except for one) included a comment that they did not like the online format and the heavy use of technology was unattractive, and stated they would have preferred a conventional instructor-based course . Another common complaint was the difficulty in doing team work, with the dominant preference being to produce the work on one’s own rather than wait for responses from virtual team-members. It would appear that the face-to-face element is not easy to replace.

2.1.2 Blended Group

The students in this group were administered a more detailed questionnaire about their experience with the Camtasia [5] recordings. Most of the students offered positive feedback in the freeform comments section, for example

- "Very helpful in all aspects, should be used in all courses"
- "It helped me reinforce what I learned in class, and I used the recorded lectures to study as well. It was very useful."
- "Excellent, sometimes students have trouble keeping up w/the class or miss a class and the recorded lectures make the materials accessible".
- "It allowed me to re-listen as many times as I needed and at my convenience. I found it a great was to reinforce the lesson in class".
- "I used it after each lesson to review what was done in class to get a better understanding of the material. The advantage is that you can refer back to the lecturer if you forgot something or additional explanation".

The results from the blended courses are presented in Tables 1 and 2. In Table 1 one can see that the proportion of students accessing the online recordings is approximately even across both semesters, with roughly two-thirds of the class utilizing the recordings.

	Fall 2011		Spring 2011	
Access Recordings?	Yes	No	Yes	No
	69%	31%	65%	35%
Recordings used regularly after class to improve understanding	54%		60%	
Recordings used in order to catch up when missed class	46%		40%	

Table 1: Feedback from the Recorded Lectures experience from Fall 2011 and Spring 2011 for a course in quantitative methods for business.

	Fall 2011	Spring 2011	Sample Comments
Self-paced Regular use	12	7	Watching the recorded lectures was really easy, it was nice being able to fast forward through the lectures to find a part I really needed. Excellent learning method. It has helped me keep on top of things.
On Demand Used when needed	6	10	Nothing is the same as the actual classroom but it was helpful if I had to miss class.
Helped gain confidence in material	10	16	It helped me reinforce what I learned in class, and I used the recorded lectures to study as well.
Interactive	9	1	They are fun; Personal Tutor.

Table 2: Free-form comments on recorded lectures

In Table 2, we have provided a broad classification for some of the free-form comments. One can see that the potential advantages of the recorded classes are (a) the ability to cater to different levels and needs (b) improves students' confidence in the material and (c) on demand lecture helps students catch up material they missed. The number of students using the recordings on a regular basis is higher in Spring 2011 than in Fall 2011. One reason for this might be that the instructor did not emphasize their presence in Fall 2011, whereas in Spring 2011, the instructor highlighted this facility on a regular basis. However, the total number of students using the facility either regularly or on a need to know basis is roughly the same.

We can conclude from this analysis that students in the blended group are using the recordings mainly as a method of re-enforcing and that the recordings are beneficial to the learning process, but not a critical component. This is not the case for the online group for whom the recordings represent an integral part of the learning experience.

3 ONLINE HOMEWORKS

We now turn our attention to the electronic homework system. For each unit of the course, a number of homework problems were assigned via Blackboard's electronic test facility. The homework had to be completed by an assigned deadline. Once students submitted their homework results, they were able to observe their results. In this analysis we examine the impact of the homework component on the overall course grade when comparing the online group (Summer 2010) with the blended groups (Fall 2010 and Spring 2011).

In our earlier analysis (ref NBEA10) we found that the electronic homework system offered two benefits:

- students were cognizant of the impact of not doing the homework
- since the homework was graded automatically, instantaneous feedback was available.

In this paper we extend this question and consider if there was a difference between the online and the blended experience with respect to the correlation between average homework grade and course grade.

Consequently, for this study, we have used the identical course material and homework problems with the same weight in the overall course grade.

3.1 E-homework vs Course Grade

We have analyzed data sets from Fall 2010 and Spring 2011 for the blended course and from Summer 2010 for the online course experience. The main difference between the two

types of courses is the face-to-face interaction that is present for the blended course and not for the online version.

For each data set, we have calculated the average homework grade and proportion of homework responses and compared this value with an adjusted course grade in which the homework component has been removed. This is to exclude the effect of the homework grade and to see only the indirect correlation of homework with course grade (based on everything except homework).

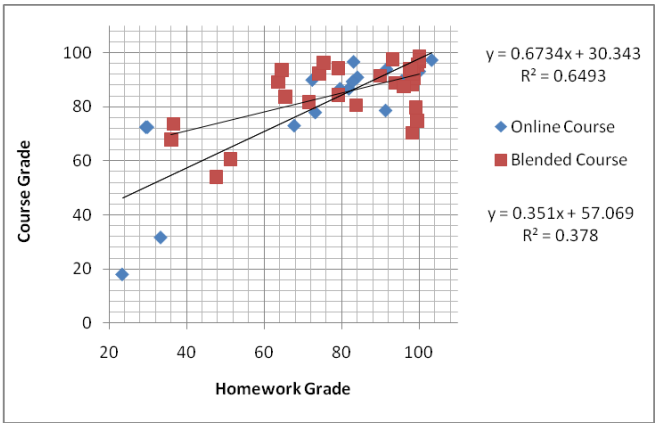

Figure 1:Correlation results between homework grade and course grade for the online vs blended course in quantitative methods

For both versions of the course there was strong correlation between homework grade and the overall course grade. The noticeable difference is the degree of correlation: for the online class it is higher than with the blended version. In fact, online course results had a 65% correlation, whereas for the blended course the correlation was 38% in Spring 2011, 48% for Fall 2011 section AA and 38% for Fall 2011 section AB. This suggests that the homework component is critical for students taking the online course whereas for the blended course, doing homework generally leads to better course grades but it is possible to obtain a favorable course grade even if homework grades are low. Note that the online results were obtained from a single group of students and a more detailed study needs to be conducted.

3.2 Descriptive Statistics

We next consider descriptive statistics for a modified course grade in which the homework component was removed and compared this grade with the average homework grade. By removing the homework component, the effect of the homework grade itself is eliminated and we are left with the impact of actually doing homework and can evaluate its benefit.

Table 3 compares the averages and standard deviations of the final grades for a selection of sections of the course in chronological order.

One can see that for all sections considered (regardless of instruction mode) the average homework grade is approximately the same except for Spring 2011 in which the both the average is higher, but there is also less variability. The reason for this might be linked to the strong background of a large body of students in that particular class who as a cohort, consistently achieved high homework grades throughout the course. This can also be observed in the slighly favorable outcome in their final exam grade as compared with the other sections.

The results suggests that doing homework may slightly improve the final grade in the course, however the face-to-face interaction seems to be more significant in terms of the final course grade. In order to fully test this hypothesis, more evidence is needed for the online group.

	Mean	Min	Max	St Dev
Online Course				
Sum 10 HW	**72**	23	100	**26.29**
Sum 10 Course	**79**	18	97	**21.98**
Blended Course				
Fall 10 AA HW	**72**	9	100	**31.19**
Fall 10 AA Course	**84**	36	99	**14.24**
Fall 10 AB HW	**72**	4	100	**28.93**
Fall 10 AB Course	**83**	65	98	**10.61**
Spring 11 HW	**83**	36	100	**19.89**
Spr 11 Course	**86**	54	99	**8.94**

Table 3: Descriptive Statistics for impact of electronic homeworks on course grade

4 CONCLUSIONS AND FURTHER WORK

The author described a hybrid approach in which two innovations were integrated into the classroom environment. These were (a) the use of non-intrusive recorded lectures to assist in the learning process when the skills of the students in the audience is non-uniform and (b) the use of electronic homework to re-enforce the material learnt in class. Both mechanisms were piloted at the undergraduate level for two modes of study: online vs. blended instruction. Students reported that when electronic recordings of the lectures were

coupled with conventional classroom instruction, they gained more confidence in the material and found the self-paced instruction positive. In addition, students commented that the electronic lectures helped make the problems more interactive. The results of our analysis can be summarized as follows:

(a) For the online mode, students found the course intensive, fast paced and only the extremely dedicated and self-motivated students completed the course successfully. The recordings were found to be an *integral* part of the learning experience. For the blended mode, where recorded lectures were optional, students reported that the recordings enhanced their learning experience and improved their confidence in the material being mastered, but were not critical to their progress. Recordings should therefore be instituted as an *active* component for the online course and a *passive* component for the blended course.

(b) There was a correlation between the average homework grade and the final class grade. Students who performed well in the homework achieved the better grades, than their contemporaries who did not attempt the homework or who did little or no homework.

(c) The homework component was critical for students taking the online course whereas for the blended course, doing homework generally led to better course grades but it was possible to obtain a favorable course grade even if homework grades were low.

(d) Doing homework may slightly improve the final grade in the course, nevertheless, the face-to-face interaction in the blended course seemed to be a more significant factor in terms of the final course grade. In order to fully test this hypothesis, more empirical data is needed from the online group. This is a topic for future research.

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