Student centred teaching of accounting to engineering students: Comparing blended learning with traditional approaches

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Blended learning is growing in popularity, but there is conflicting empirical evidence in relation to how it affects students' exam marks and final grades. This paper compares a blended learning approach to the traditional delivery of an accounting subject to engineering students. Data was collected from two cohorts of students over two semesters and analysed to determine whether the students who were exposed to the blended environment displayed increased participation in a non-compulsory learning task and higher marks in both in-session and final examinations. Results indicated significant improvements in every area, supplying valuable evidence that the adoption of a blended approach in higher education can appreciably enhance students' results and experience by providing a more student-centred learning environment.

Keywords: blended learning, student-centred learning, higher education, accounting, pedagogy

Introduction

The pedagogy of a blended learning environment is "based on the assumption that there are inherent benefits in face-to-face interaction as well as the understanding that there are advantages to using on-line methods" (Clark & James, 2005, 19). It has been suggested that such an environment promotes student-centred learning and encourages increased student interaction (Carmody & Berge, 2005; Davies & Graff, 2005; Gallini & Barron, 2002).

Recent research has reported the increased benefits a blended learning approach in relation to discussion forums and other collaborative features (Dzuiban, Hartmann & Moskal, 2004; Waddoups & Howell, 2002). In addition, by providing students with more control over their learning, blended learning can help foster critical thinking (Garrison & Kanuka, 2004). Other studies have addressed the techniques for blending elements of a traditional classroom with online education (McAlpine, Reidsema & Allen, 2006; McCray, 2000; Twigg, 2003; Yoon & Lim, 2007). These have included the effectiveness of online assessment systems (Dopper & Sjoer, 2004) and computer tutorials (Merino & Abel, 2003).

However, there has been little evidence to show that a blended learning environment has tangible benefits as measured by levels of voluntary preparation of weekly work or performance on a final examination. This current study evaluates the difference in student preparation and performance when a blended learning environment is adopted as compared to a traditional approach.

The remainder of the paper is structured as follows. Section 2 provides a brief review of the literature in relation to student centred pedagogy and the blended learning environment. Section 3 describes the two cohorts of students, discusses the approaches that are compared in the study and develops the hypotheses. Section 4 presents the data analysis which is then discussed in Section 5. Section 6 provides concluding comments.

Literature review

Self-directed learning, an early forerunner of student-centred learning, has been defined as a process "in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975, 18). This effectively places the individual at the centre of the learning process. Similarly, it has been suggested that "students learn well when they take responsibility for their learning" including "freedom to waste the opportunity as well as freedom to exploit it in the best possible way" (Gibbs & Habeshaw, 1989, 37).

To this end, student-centred learning implies a "need for students to assume a high level of responsibility in the learning situation and be actively choosing their goals and managing their learning. They can no longer rely on the lecturer to tell them what, how, where and when to think. They must start to do this" (Sparrow, Sparrow & Swan, 2000). It has been suggested that student-centred learning "recognised that students learn in different ways and have different learning styles" and that their learning is "an active dynamic process" (Di Napoli, 2004, 3). Further, with student-centred learning "the individual is 100% responsible for his own behaviour, participation and learning" (Brandes & Ginnis, 1986, 12).

Many universities have added computer components onto their traditional approaches or alternatively introduced online material similar to that previously delivered by traditional methods. However, a large number of comparative research studies have shown no significant difference in learning outcomes (Russell, 2001; Twigg, 2003). For instance, Merino & Abel (2003) evaluated the effectiveness of computer tutorials versus traditional lecturing in teaching accounting to engineering students, and found that there was not significant difference between the results of the two methods. Johnson (2002) also found no significant difference when investigating learning outcomes for students undertaking biology courses online and in traditional mode. Similar non-significant results was found by Holman (2000) when she evaluated the difference with reference to library material.

Such findings indicate that simply converting a traditional face to face course into an online delivery format does not necessarily improve student outcomes. To achieve gains in student outcomes, the course must use the online components to adopt a student-centred pedagogy. It has been suggested that the whole course needs to redesigned to make "the teaching-learning enterprise significantly more active and learner-centered" (Twigg, 2003, 30). Yoon and Lim (2007) stressed the importance of designing a blended learning course with the why and the how at the forefront. Thus, an appropriate definition of blended learning is "an optimal combination of face-to-face and online education that improves learning and the satisfaction of instructors and students" (Bourne, Harris & Mayadas, 2005). In addressing why educators choose to introduce a blended approach, Graham, Allen & Ure (2005) and found that two main reasons were improved pedagogy and increased access and flexibility. (See also Williams (2002).)

Improved pedagogy is consistent with adopting a student-centred approach since blended learning strategies allow students autonomy in self-paced learning, increase the level of active learning strategies and enhance peer-assisted learning (Graham, 2005). Cottrell & Robison (2003) reported a blending learning strategy whereby online modules were used to build technical accounting proficiency while face-to-face classes focussed on developing decision making skills. Using such online capabilities to present self-paced units to introduce and build basics frees time for students to participate in interactive exercise in class time (Bourne *et al*, 2005).

A student-centred pedagogy must focus on providing increased access to learning and more flexibility in the learning environment. Many students who want the advantage of being able to study online with convenient access to learning materials, also want the social interaction of the face-to-face experience. A blended learning approach helps provide this balance between flexible delivery options and live interaction (Utts *et al*, 2003). Furthermore, a blended learning environment "aims to enable students to take much more responsibility for their own learning by focussing on *what the student does*" (Subic & Maconachie, 2004, 35). By using action learning and reflective practice, blended learning promotes the adoption of deep approaches to learning, which is facilitated by group activities.

The next section describes the student cohorts and the traditional and blended approaches that are compared in the current study.

The study

In this study, students were given significant flexibility and autonomy in the blended environment Flexibility was not just provided by the online components but also by the extended time in which students had to undertake various elements of the course. Further, it was the individual student's choice whether to attempt various assessment tasks, with the only provisos being that they had to achieve an overall mark of at least 50 percent in the course and sit the final examination.

The participants: The two cohorts

Participants consisted of graduate engineering students enrolled in a financial management course in two different semesters. All students were seeking a Master's degree in engineering, with the majority of the students being male. This course was compulsory for around two thirds of the students and chosen as an

elective by the other third as shown in Table 1. There were also a mixture of part-time and full-time students in each semester. Although the part-time students were already in the workforce, they revealed that they had had very limited exposure to accounting concepts prior to enrolment in this subject.

Table 1: Description of participants

	Traditional cohort 2005 n = 40 (%)	**Blended cohort 2006** n = 46(%)
Subject choice		
Compulsory	25 (62.5%)	30 (65.2%)
Elective	15 (37.5%)	16 (34.8%)
Study mode		
Full time	35 (87.5%)	33 (71.7%)
Part time	5 (12.5%)	13 (28.3%)
Gender		
Males	33 (82.5%)	43 (93.5%)
Females	7 (17.5%)	3 (6.5%)

The setting

Both courses were presented at a regional Australian university with the same teaching staff. The semester length of 13 weeks was identical for both cohorts. However, in 2005 a traditional approach was used for both delivery and assessment, whereas in 2006 the course was completely redesigned and a blended approach was adopted combining both face-to-face and online modes.

Traditional approach

> Most traditional courses are described and indeed predicated on what the teacher does (Martin, 2000).

Under the traditional approach, subject material was delivered in 12 two-hour lectures with the final week being a review. In addition, students were expected to attend their allocated one hour tutorial on a weekly basis bringing with them solutions to prepared textbook questions which would then be discussed in class. Assessment components consisted of the weekly tutorial questions, a group assignment, a mid-session paper-based multiple choice test held during the lecture time in Week 9 and a final examination, all of which were compulsory.

Blended approach

> A student-centred course makes a clear commitment not merely to focus on the student activity but may also give students choice in the directions their learning takes. It therefore involves considerable delegation of power by the lecturer and an equivalent assumption of responsibility by the students." Martin (2000)

Under the blended approach there was both a face-to-face component and an online component. The face-to-face component consisted of one full-day workshop held in Week 2 and two half-day workshops held in Weeks 7 and 11. These not only provided opportunity to communicate subject material, but also a chance for students to interact with it and with each other. They also provided a valuable forum for group presentations and interactions where students could learn from each other. The workshops were supplemented with the provision of online notes and an online serialised case study. The online component was delivered using a WebCT Vista interface which allowed extensive use of both student-student and student-coordinator asynchronous discussion between the workshop sessions. Assessment items consisted of weekly online textbook questions, an assignment consisting of both a group element and an individual online element, a series of three multiple choice online tests in Weeks 6, 10 and 13, and a final exam, with only the final exam being compulsory.

These online components promoted student-centred learning in that they provided significant autonomy for students in terms of when, where and even what they attempted (Gibbs and Habeshaw, 1989; Sparrow, Sparrow & Swan, 2000). The weekly questions were available from 9 am on Saturday morning until 9 am on Friday. Whereas students were not compelled to complete these questions, they did provide a valuable study tool to assess their understanding of the subject matter. They also helped students in preparing for the online tests and the final examination. Suggested guidelines for answering weekly questions were provided on the website at the end of each week.

The online tests were also available over an extended time – from 9am Saturday until 9 am Friday in the weeks in which they were held. The questions were drawn randomly from a test bank with similar questions being grouped together, meaning that while each test was of similar composition, it would be highly unlikely that any two would be identical, thus maintaining the integrity of the testing process. In designing these tests, it was decided that they should provide not merely summative, but also formative assessment (Weston, McAlpine & Bordonaro, 1995). Consequently, students were able to have up to two attempts at each test during the release period, with their average mark being recorded. Taking the average mark ensured students would make genuine attempts, but also allowed further study time between the two attempts – provided, of course, that the students made their first attempt early in the week. The formative nature of these tests meant that their aim was not only "to 'quantify' a student's performance in terms of the number of 'facts' they are supposed to acquire" but also to help them to understand "the processes through which they arrive at certain conclusions in solving a given task/problem" (Di Napoli, 2004, 2-3). Thus, these tests provided support for students as they worked their way through the course.

The case study assignment afforded an avenue for students to participate in group work, both face-to-face and online. In addition, there was an individual element which had to be submitted online in which students reflected on the performance of both themselves and their fellow group members, and assessed each individual's contribution to the project. As found by McAlpine *et al* (2006), the process of completing this feedback improved students' awareness of group processes and helped them to understand the need to contribute effectively. This feedback also provided valuable data that could be used as part of the overall assessment of the assignment (McGourty, 2000). In addition, the online nature of the submission offered a confidential medium through which students could submit their peer assessment.

The blended approach provided significantly more flexibility in terms of both location and time management and attracted a significant increase in part time student enrolment with almost 30 percent of students being employed in the workforce while studying as opposed to only 12.5 percent being employed when the traditional approach was undertaken (as shown in Table 1).

Hypothesis development

Students who experienced the blended approach were given freedom as to whether they would complete all assessment components or not, as opposed to those who experienced the traditional approach where all components were compulsory. Research has shown that providing such choices correlates to students adopting a deep approach to learning (Entwhistle, 1988; Ramsden, 1992) and is an essential part of a student-centred pedagogy (Brandes & Ginnis 1986; Gibbs & Habeshaw 1989). This leads to the first hypothesis:

Hypothesis 1 (null)

> There is no difference between the average number of times weekly questions were attempted by the traditional cohort and the average number of times weekly questions were attempted by the blended cohort.

Hypothesis 1 (alternative)

> There is a significant difference between the average number of times weekly questions were attempted by the traditional cohort and the average number of times weekly questions were attempted by the blended cohort.

In order to test whether the cohort of students who experienced the blended approach performed better than the cohort of students who experienced the traditional approach, two different sets of data were compared for each cohort. The first data set was in relation to the average marks obtained for in-session tests and the second, in relation to the average final examination mark for each cohort of students. This resulted in the following two hypotheses:

Hypothesis 2 (null)

> There is no difference between the average in-session test result for the traditional cohort and the average in-session test result for the blended cohort.

Hypothesis 2 (alternative)

> There is a significant difference between the average in-session test result for the traditional cohort and the average in-session test result for the blended cohort.

Hypothesis 3 (null)

There is no difference between the average final examination result for the traditional cohort and the average final examination result for the blended cohort.

Hypothesis 3 (alternative)

There is a significant difference between in the average final examination result for the traditional cohort and the average final examination result for the blended cohort.

Data analysis

To test these hypotheses, data was collected in relation to students' performance in the two cohorts, one of which was exposed to a traditional approach and the other to a blended approach. The descriptive statistics for the two cohorts are shown in Table 2.

Table 2: Descriptive statistics for the two cohorts by approach to which they were exposed

	n	Mean	Std Dev	Min	Max
Traditional cohort	40				
Attempts at weekly questions		9.05	2.68	3.0	12.0
In-session test		55.91	15.24	27.5	85.0
Examination		44.24	13.64	16.5	75.0
Final mark		57.48	13.45	28.0	86.0
Blendedcohort	46				
Attempts at weekly questions		10.92	2.18	0	12.0
In-session test		44.60	10.95	44.6	90.8
Examination		55.56	14.29	20.0	77.5
Final mark		68.70	7.80	54.0	85.0

The purpose of the study was to identify if there were significant differences between the behaviour and results of students undertaking the subject by the traditional approach and those who undertook it by the blended approach. For each hypothesis, an independent samples t-test comparing the respective variable of the two cohorts was used to test the hypothesis. This test is appropriate because the independent or grouping variable is nominal (approach = traditional vs. blended) and the dependent variable in each case is scale.

H1: Comparing attempts at weekly questions

Students could make up to twelve attempts at weekly questions. Under the traditional approach, the attempts were physically checked in the allocated tutorial each week. Under the blended approach the students had from 9 am Saturday until 9 am Friday to submit there attempts online. Results of the t-test are shown in Table 3. The Levene's test for equality of variances, the significance value, ($p = 0.001$), is less than the threshold of 0.05, thus equal variances cannot be assumed.

The blended cohort made a larger number of attempts at weekly questions by an average of 2.04 (9.05 vs. 11.09) which is significant ($p = 0.000$). Therefore, the null hypothesis is rejected and the alternative hypothesis accepted, concluding that there is a significant difference in the number of attempts between the two cohorts.

H2: Comparing the results for in-session tests

Students could achieve a mark of up to 100 in the in-session test element of the assessment. Under the traditional approach, this mark was achieved in one test held in a particular week. Under the blended approach, the mark was the aggregate of the scores for online tests held at three different times during the semester. Results of the t-test are shown in Table 4. The Levene's test for equality of variances, the significance value, ($p = 0.017$), is less than the threshold of 0.05, thus equal variances cannot be assumed.

Table 3: Results of t-test for H1: Comparing attempts at weekly questions by cohort

Group Statistics

	Cohort	N	Mean	Std. Deviation	Std. Error Mean
No. of attempts	Traditional	40	9.05	2.679	.424
	Blended	46	11.09	1.490	.222

Independent Samples Test

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Upper	Lower
No. of attempts	-4.263	59.407	.000	-2.04	.478	-2.996	-1.082

Table 4: Results of t-test for H2: Comparing results for in-session test by cohort

Group Statistics

	Cohort	N	Mean	Std. Deviation	Std. Error Mean
In-session test result	Traditional	40	56.23	15.118	2.390
	Blended	46	75.49	10.953	1.615

Independent Samples Test

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Upper	Lower
In-session test result	-6.677	70.080	.000	-19.26	2.884	-25.013	-13.508

The blended cohort scored a higher mark in the in-session test by an average of 19.26% (56.23 vs. 75.49) which is significant ($p = 0.000$). Therefore, the null hypothesis is rejected and the alternative hypothesis accepted, concluding that there is a significant difference in the average score achieved by each of the two cohorts.

H3: Comparing the results for final examinations

Students could achieve a mark of up to 100 in the final examination. Results of the t-test are shown in Table 5. The Levene's test for equality of variances, the significance value, ($p = 0.721$), is greater than the threshold of 0.05, thus, in this case, equal variances can be assumed.

The blended cohort scored a higher mark in the final examination by an average of 11.32% (44.24 vs. 55.56) which is significant ($p = 0.000$). Therefore, the null hypothesis is rejected and the alternative hypothesis accepted, concluding that there is a significant difference average score achieved by each of the two cohorts.

Gender, mode of study, choice of subject

Independent samples t-tests were also carried out to determine whether any of the results (weekly questions, tests, final exam) were significant in relation to the dichotomous variables, gender (male vs. female), mode of study (full time vs. part time) and choice of subject (compulsory vs. elective). In each case the significance level was consistent with the null hypothesis, which meant it could not be rejected. This indicated that there are no significant differences based on these variables.

Table 5: Results of t-test for H3: Comparing results for final examination by cohort

Group Statistics

	Cohort	N	Mean	Std. Deviation	Std. Error Mean
Final exam result	Traditional	40	44.24	13.643	2.157
	Blended	46	55.56	14.294	2.108

Independent Samples Test

	t-test for Equality of Means						
						95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Upper	Lower
Final exam result	-3.743	84	.000	-11.32	3.026	-17.342	-5.308

Discussion

The results of this study are relevant because they indicate that by adopting a student-centred blended learning approach, both student motivation and student grades can be improved. The significantly improved results for the online tests occurred because students took advantage of the extra learning opportunities provided through the weekly questions. The feedback supplied on these tests helped students to learn from their mistakes which influenced the improved results in the final examination for those students exposed to the blended approach. Thus, similarly to the results of Dopper & Sjoer (2004), this study showed that the formative assessment provided by these online tests made an important contribution to improving student learning.

Table 6 provides comparative final grades for the course. These are the summation of all the individual assessment components for each semester offering. It is interesting to note that the cohort who experienced the blended learning environment achieved higher grades, despite the fact that they were under less compulsion to attempt the various assessment items. It may have been expected that students would not complete all components because they did have to do so, but the results indicate exactly the opposite, possibly indicating their engagement with the course and the learning process.. In relation to the final mark, the blended cohort scored a higher overall mark by an average of 11.17% (57.52 vs. 68.70). This is a significant difference ($p = 0.000$) indicating that when students are given the opportunity to take responsibility for their learning, they will be more likely to be active learners (Di Napoli, 2004).

Table 6: Final student grades

Grade	**Mark range**	**Traditional cohort**		**Blended cohort**	
		n	*%*	*n*	*%*
High Distinction	85-100	3	6.5	1	2.5
Distinction	75-84	9	19.6	2	5.0
Credit	65-74	20	43.5	10	25.0
Pass	50-64	14	30.4	18	45.0
Fail	0-49	-	-	9	22.5
Total		46	100	40	100

Conclusion

This study has evaluated the participation and performance of students exposed to two different learning environments. This was achieved by comparing two cohorts of graduate engineering students who studied the same accounting subject presented in two different semesters, one by a traditional approach and the other by a blended student-centred approach.

The average number of times students attempted weekly questions was compared for both approaches, with the result being that their was s significantly higher attempt from students in blended approach, indicating that despite the fact that these were not compulsory, students took increased responsibility for their own learning. Average marks for both in-session tests and final examinations were also compared. Again, students who experienced the blended environment, achieved significantly higher results.

Overall, the findings reinforce the view that a blended learning environment promotes student-centred learning by empowering students to take more responsibility for their learning and to increase the involvement and participation necessary for that learning.

While not specifically tested, the findings also suggest that such a blended learning pedagogy supports the development of life-long learning by providing a model where the learners are the focus. By being flexible, both in terms of place and time, a blended environment provides a rich educational experience with an emphasis on active learning.

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