Acceptance of Blackboard Technology by Mechanical Engineering Students at the University of Botswana*

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Technology-based teaching and learning is entering academic life at an amazing rate. It comes whether invited or not. Students and lecturers are confronted with new technologies. There are new teaching methods to accompany them, and new pressures to use them. E-learning is penetrating all areas of teaching and learning: academic institutions and corporate training alike. It has been generally accepted as a major and viable component of higher education. However, it is not clear how students accept the use of new technology. This paper deals with the question of acceptance by analysing the University of Botswana engineering students' reflection on Blackboard technology.

Keywords: e-learning; WebCT/Blackboard; acceptance; mechanical engineering students

INTRODUCTION

TECHNOLOGY-BASED TEACHING AND LEARNING is entering academic lives at an incredible rate. Students and lecturers are confronted with new technologies, new teaching methods to go along with them, and new pressures to use them. E-learning is penetrating all areas of teaching and learning; it invades academic institutions as well as corporate training. It is also generally accepted as a major and viable component of higher education.

E-learning systems require good communication facilities—such as broadband networks. It is nevertheless quite obvious that course content and student performance assessment are as important as the instruction delivery facility itself. What may be considered less obvious, although it is probably even more important, is the student acceptance of the new technology. Has the approval of learners to use e-learning technologies been sufficiently examined?

Although there have been several studies conducted to evaluate web-based educational platform from pedagogical and institutional perspectives [1–6] there have only been a few studies conducted to evaluate the usability of such systems from the student viewpoint [7–9]. However the focus of these studies was more on comparing different systems than a usability study. The literature relating to engineering courses does not normally report on the attitude of students towards e-learning: it deals with Web-based supporting materials and study modules [10, 11] or experiences in developing virtual courses on a particular subject, such as electronics [12, 13], chemical engineering [14, 15] or control systems [16]. It also addresses the specific needs for virtual lab systems, which is so important in engineering courses [17, 18].

Online learning constitutes just one part of technology-based learning and describes learning via the Internet, intranet and extranet. The levels of sophistication of online learning vary. A basic online learning software includes the text and graphics of the course as well as record keeping. However, there are also 'all-in-one' software packages which, apart from providing students with course material, enable a host of other functions. The most popular packages are WebCT and Blackboard [19], Questionmark Perception [20] and I-Assess [21], which have been developed in order to provide delivery and assessment of courses. They combine functions such as discussion boards, chat rooms, online assessment, tracking of students' use of the material, and course administration and act like any other learning environment by distributing information to learners.

The University of Botswana is currently using Blackboard technology as an educational web-based platform for students and lecturers to use in order to assist and complement traditional classrooms delivery, i.e. a blended model.

BLACKBOARD TECHNOLOGY AT THE UNIVERSITY OF BOTSWANA

Blackboard technology was introduced at the University of Botswana (UB) in 2002. The rationale was to expand access to academic

programmes and to enrich their quality. WebCT was considered to be the right learning management system in the UB context, mainly due to its flexibility and ease of use. The features which were most relevant for selecting WebCT included the following:

1. an easy way to manage and to put course content on-line;
2. access control (password protection);
3. student progress tracking;
4. grade maintenance and distribution as a method to keep grades on-line.

Apart from the above, the features of WebCT deemed to be attractive included the bulletin board, a chat facility, private class e-mail, auto-graded on-line tests, group project organization, access control, course calendar software as well as many other tools.

The number of courses using Blackboard technology has increased dramatically from 7 in 2002 to about 200 courses and 101 'course designers' (out of about 750 teaching staff) in the 2007/08 academic year (the number of courses varies between semesters in a given academic year). The total number of students registered in the system in 2007/08 was over 8000 (of a total of a population of about 15 000 students at UB). Although impressive, the numbers should be regarded with caution as not all of the courses are developed fully and not all registered students take full advantage of the technology.

The Educational Technology Unit (EduTech) of the Centre for Academic Development of UB has developed CAD eLearning Certificates training workshops, including workshops specifically dedicated to Blackboard technology. By the end of the 2007/08 academic year some 500 lecturers attended the workshops. However, not necessarily all of those who attended decided to implement the technology. Similarly, some lecturers who had not attended the workshops adopted the new technology.

The response from staff on the introduction of Blackboard was initially quite enthusiastic as the technology was considered to be a 'novelty'. However, with time staff realized that the development of a fully fledged course in Blackboard technology is very time-consuming as it also involves continuous management of the course. The idea of a reward system, either financial or in the form of equating course development to a research paper for assessment purposes has been suggested, but still not seriously discussed.

The general opinion of staff of the new technology is positive, although some identified a few setbacks in the platform. The major complaints have been about file handling, group management and importing of data from spreadsheets. However, the chief complaint has always been about network problems that are unrelated to the Blackboard platform.

ADVANTAGES OF E-LEARNING

There are some obvious advantages of using e-learning. The major one being: 'Anywhere, Anytime' [22]. This approach can offer a logical solution for education and training objectives at the university. It allows students to have 24-hr access to the relevant information from almost anywhere in the world and to work at their own pace. Since most of the students already use computers, and the special platforms are usually user-friendly, there should be no problem for users to operate and work with the e-learning software.

The advantages of e-learning can be summarized (although not limited) to the following main points:

1. just-in-time access to timely information;
2. higher retention of content through personalized learning
3. improved collaboration and interactivity among
4. online training is less intimidating than instructor-led training; and
5. learning has become a continual process rather than a distinct event.

E-learning however is not simply the application of information and communication technologies (ICT) to education. In order for e-learning lecture based course to add value for learners and teachers it requires enormous efforts. The complexity of learning, as a cognitive and knowledge-oriented process, makes the establishment of effective e-learning method, using ICT, more difficult.

STUDENTS REFLECTION ON BLACKBOARD TECHNOLOGY

The results presented in this paper are based on the application of Blackboard technology in two courses offered in semester 1 of the academic year 2007/08 in the Department of Mechanical Engineering at the University of Botswana. Forty students attended these courses. The teaching for the courses was done using the traditional method of lectures, tutorials and labs (with the application of PowerPoint for lecture delivery) as well as Blackboard, which was used for all elements of teaching, including the provision of teaching material and communication with students. It was also used by the students to submit all (apart from tests) elements of the continuous assessment (assignments, projects, lab reports).

The Blackboard material for students was grouped into topics as per lecture delivery. The material for each lecture included lecture notes, PowerPoint Presentation (in pdf format), summary (with the most important information), examples with solutions, a list of problems (with answers but not solutions) and a self-test (in the form multiple choice questions). In the majority of topics there was also extra material giving a different approach

to a particular topic and some video clips from engineering software on the element/material performance or behaviour. Access to the material was monitored on a weekly basis.

The questionnaire was handed out at the end of the classes; all 40 students completed the course and all of them completed the questionnaire (overall response rate of 100%).

As with any self-reported survey, it is not possible to verify if the students completed the questionnaire honestly and accurately. The honesty issue was not addressed directly but the questionnaire was anonymous and hence had no influence on the marks. The students were also briefed on the purpose of the survey and how the results of the survey could improve the use of Blackboard. The question of accuracy was dealt with by a pilot testing questionnaire, which showed that the questions were sufficiently comprehensible for the students to answer them accurately.

Students' general reflection on technology

Students did not have any reservations about using Blackboard; only 1 out of 40 students felt threatened when people talked about Blackboard and was uncomfortable when working on Blackboard. More, but still only 6 out of 40 students, felt stressed when using the technology. As expected, the students were able to quickly master the Blackboard environment and indicated very few problems in interacting with Blackboard. They considered Blackboard to be fairly easy to use and noted that it was easy to remember how to perform various tasks (Fig. 1). The most commonly reported problem throughout the semester was insufficient access.

The students had a strong impression that the use of Blackboard empowered them and that the exercise gave them a sense of being in charge of their learning. However, the students were not sure whether the use of Blackboard brought learning closer to the outside world or whether it was closer to the lecturer's thoughts about the course (Fig. 2). There was an interesting suggestion from some of the students (in the open question part of the questionnaire) on how to help students to understand Blackboard better and make it easier to use: the recommendation was that the students should be advised to use it like they use e-mail and not to follow lengthy introductions or study manuals.

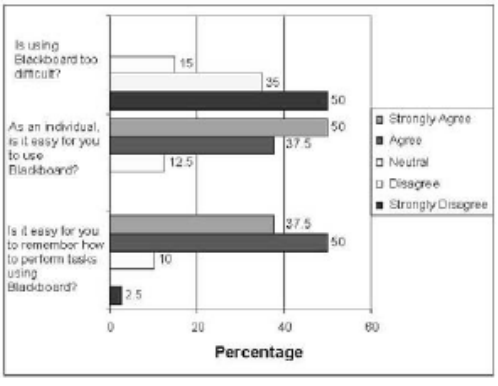


Fig. 1. Difficulty in using Blackboard.

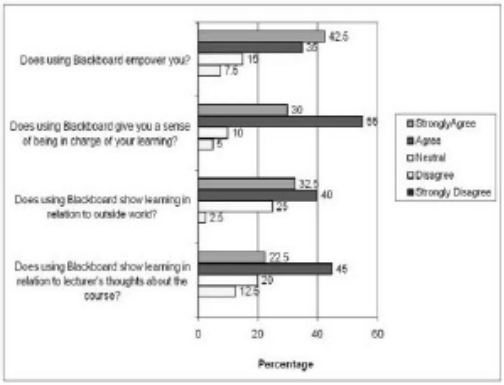


Fig. 2. Application of Blackboard.

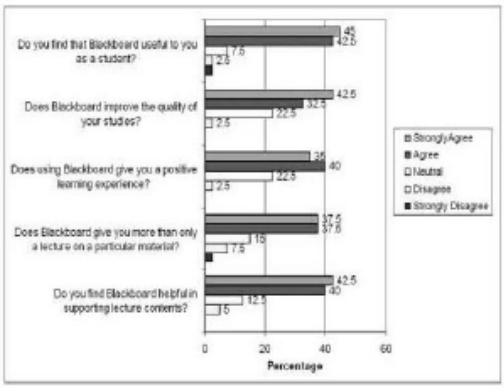


Fig. 3. Blackboard as a teaching approach.

Students' reflection on teaching approach

The vast majority of students (87.5%) considered that the new technology was useful to them as students (Fig. 3).

Also a large majority was of the opinion that it improved the quality of their studies (75%) and that it was a positive learning experience (75%). However, in both cases there were some students who gave neutral answers to the above questions (22.5% in both). Again the majority (75%) thought that incorporating Blackboard into the teaching provided them with more insight into a particular topic than just the lecture itself. Similarly, 82.5% of the students indicated that Blackboard was helpful in supporting lecture content.

The questionnaire also contained an open question about how Blackboard helped students in their performance in the courses. The results presented in Table 1 show a good understanding of the general idea of e-learning and new technological platforms. The positive response to submit-

Table 1. How does using Blackboard help you as a student?

Question: *How does using Blackboard help you as a student?*	No of students (Total 40)
Most frequent answers:	
Ease in submitting assignments, lab reports	32
Extra reading material after classes & more time to analyse material	29
Improve IT skills	26
Study material at own pace	20
Encourages finding new information	10

ting course assignments on-line was especially surprising. Some additional benefits of using Blackboard were also noted; the most common of which was improvement in IT skills.

The students also suggested that there should be more discussions and more self-assessment exercises available for courses that use Blackboard.

Students' reflection on communication and general effectiveness

Students highlighted the effectiveness of the Blackboard in terms of communication (Fig. 4): 90% thought that by using this technology the communication between students and the lecturer improved; 87.5% appreciated the effectiveness in

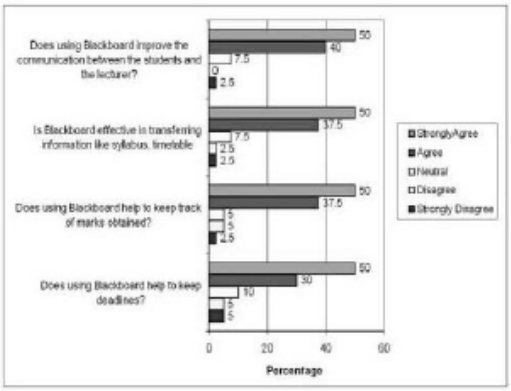


Fig. 4. Communication effectiveness.

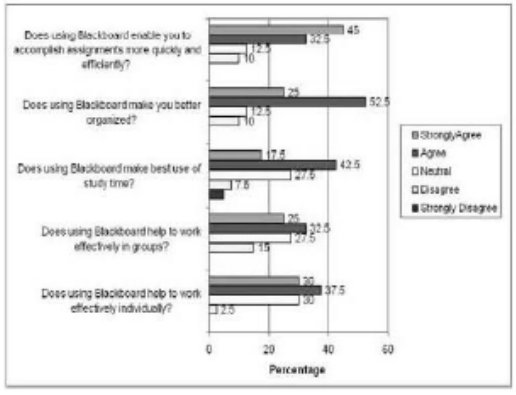


Fig. 5. General effectiveness.

Table 2. How does using Blackboard help you as a student?

Question: *How does using Blackboard help you as a student?*	No of students (Total 40)
Most frequent answers:	
Allow for easier communication with other students	30
Allow for easier communication with the lecturer (at any time)	29
Easy access to check course information (announcements, marks, deadlines etc.)	21
Help to keep the deadlines	16

terms of transferring the information on the syllabus, timetable etc. Also 87.5% agreed that it helped in keeping track of the marks. The majority of students (80%) thought that Blackboard helped them to keep to deadlines: this was mainly due to improved communication since they received individual notification and could always easily check the relevant deadline on Blackboard.

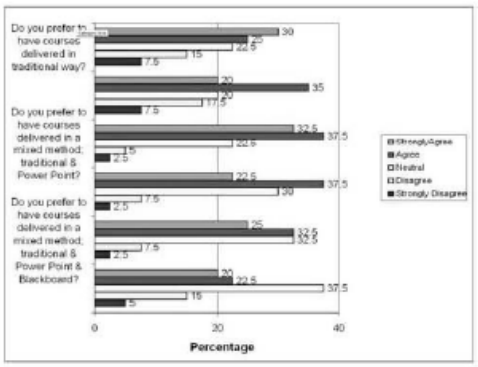
Furthermore, the open-ended question section of the survey confirmed that Blackboard was a useful communication tool, not only with the lecturer but also with fellow students. The easy way of communication as well as easy access to course information were highly appreciated (Table 2).

The overall usefulness of Blackboard in improving students' time management and work efficiency (Fig. 5) was also recognized. It helped them to do assignments quickly and efficiently (77.5%) and it made them better organized (77.5%). The other elements of the general effectiveness were also positive but with some reservations, with a good number of students being unsure whether the new technology really helped them. The majority indicated that Blackboard helped them: to make better use of their study time (60%), to work in groups (57.5%) and to work effectively individually (67.5%). In all three of the above cases approximately 30% of students were not sure about the impact of Blackboard.

Students' reflection on delivery preference

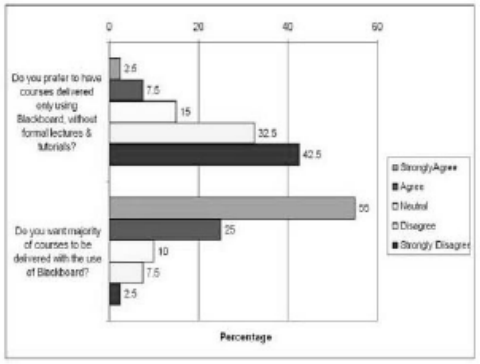
The results of the survey on the delivery preference came as a surprise as it indicated that the students do not have actually clear preferences on the way the courses should be delivered (Fig. 6(a)). It is difficult to draw any conclusions on the preference in delivery as the results are very close and in all questions there are a lot of 'neutral' answers. All suggested methods of delivery (traditional, PowerPoint, Blackboard and blended type) were accepted by students or they did not have an opinion. The three choices, 'Strongly Agree', 'Agree' or 'Neutral' constituted more than 75% of answers in all available delivery methods.

There are a few possible explanations of the above results. The obvious one is that the students are not at all concerned as to how the courses are delivered. However, this explanation may be a bit too simple and convenient for the lecturers, indi-



(a)

Fig. 6. Delivery preference.



(b)

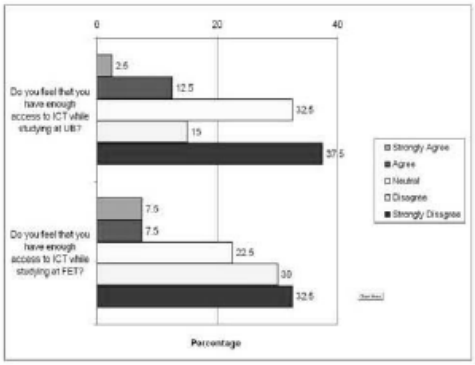


Fig. 7. Performance of Blackboard.

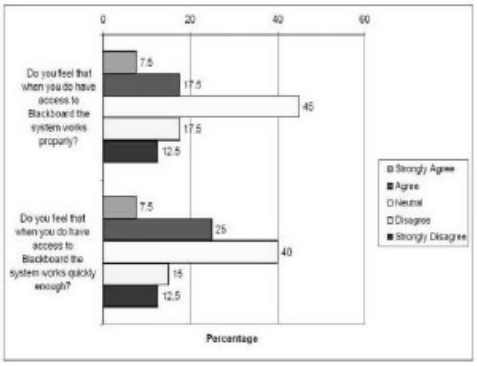


Fig. 8. ICT Access at UB.

cating that whatever method the course is delivered will be satisfactory to students. There are also other possibilities that take a less simplistic view on the students' attitude; one possible explanation would be that students value the material presented more than the way it is presented. The other possibility, which has been supported by many students in informal conversations, would be that the personality of the lecturer has a greater impact on the students and the course than the method of delivery. There is an obvious need to carry out further research in this direction.

The students are however very clear on the fact that they still want formal lectures and tutorials and that they would not be happy to have courses delivered by using only an e-learning platform (Fig. 6(b)). Nevertheless, they would prefer for Blackboard to be used in the majority of courses (Fig. 6(b)).

Students' reflections on problems encountered

One major problem that was frequently cited by the students using Blackboard was inadequate access. They did not have a clear opinion on Blackboard as an e-learning platform (the majority were neutral on both system functioning and its speed, Fig. 7), which was only reasonable since the students did not have any experience and comparison with other software. On the other hand, the majority of students complained about insufficient access to ICT at UB and Faculty of Engineering and Technology in particular. Only 15% of the students were of the opinion that they had enough access to ICT when studying at UB (32.5%—neutral and 52.5%—not enough). More dramatic results were for FET; there is still a lot of neutral students (22.5%) but here a clear majority (62.5%) were not satisfied with ICT access for students (Fig. 8).

Interestingly 65% of students viewed Blackboard as the way to improve their computer skills (Table 1). It may indicate an insufficient level of students' computer exposure in dedicated computer courses.

CONCLUSIONS

The results from the current survey were consistent with previous research findings for courses outside engineering [23, 24, 25] documenting that students did indeed possess positive attitudes toward the use of e-learning software like Blackboard. The students were very open to the new

technology. They considered it as a useful but still only additional element in the courses. They reported that course material placed on Blackboard was a valuable supplement to traditional classroom lecture approaches, reporting also that it was a good avenue for communicating with classmates. The students were of the opinion that such an approach should be adopted in other courses (78%). Surprisingly students did not express a clear preference on the method of course delivery. However, the majority of students did not accept Blackboard as the only method of course delivery and would prefer to continue having traditional lectures and tutorials with Blackboard to be used as an additional technique.

Positive attitudes towards Blackboard were also demonstrated in students' responses to questions about their general attitudes toward the new technology. For example 87.5% of students agreed that Blackboard was useful, it improved the quality of their studies (75%) and constituted a positive learning experience (75%). There was a surprisingly positive attitude of students towards submitting their assignments on-line. Additionally, students' comments on the open-ended response questions were equally positive and no negative comments were made.

The Blackboard course components considered most useful by the students were communication with the lecturer (90% positive responses) and access to course information and course marks (in both cases 87.5% positive responses).

Students were well aware of the advantages of using the e-learning platform, which provided more material that could be accessed at any time and could be studied at one's own pace. The effectiveness of Blackboard in transferring relevant course information, keeping deadlines and in enhancing communication with lecturer and other students was also noticed and appreciated.

In the students' opinion the major problem in using Blackboard was the unsatisfactory access to ICT. This applies not only to their experiences as students at UB but also particularly as undergraduates in the Faculty of Engineering and Technology.

RECOMMENDATIONS

The survey conducted among the students, although limited to only 40 respondents, provided information regarding their acceptance of a new educational technology, Blackboard. The overall students' attitude towards Blackboard was very encouraging: they thought that Blackboard was useful to them, improved the quality of their studies and gave them a positive learning experience. From this, the following recommendations can be made.

1. Extend blended learning (with the use of the Blackboard) and build-out the use of technology implementations that increase the quality of online courses and improve the breadth of coverage of courses.
2. Since preparation and organization of on-line courses is an additional requirement for staff, they should be rewarded.
3. More resources (both human and financial) should be dedicated to the improvement of the facilities (computer access for students, network upgrades, instruction designers etc.).
4. Using the Blackboard material to offer distance education modules or courses should be considered.
5. Studies need to be conducted to explore the relationship between student perceptions and educational outcomes, to evaluate the use of specific online materials and to determine if student perceptions are consistent across different curricula.

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