Assessment of ICT- based course delivery for mechanical engineering students - a case study

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Abstract

During the first semester of 2007/2008 academic session at the University of Botswana (UB), some mechanical engineering courses were delivered using a blended method i.e. online resource (eLearning) and traditional face to face approach. This paper presents results of a study to analyse students' perception of the eLearning technology, namely WebCT/Blackboard. An electronic questionnaire was administered to a cohort of third year mechanical engineering students for the study. The questionnaire consisted of 92 items that covered such areas as facilities, resources, access, instruction and quality issues. An open ended section enabled students comment on other issues related to the course delivery. The results show that students were very receptive of ICT based course delivery. The paper discusses the challenges of using eLearning and proffers recommendations to ensure that maximum benefit is derived from technological investment and staff effort.

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Introduction

One of the principal pillars in the government of Botswana's vision is to create an educated and informed nation, using, amongst other means, modern information and communication technologies (ICT) to provide access and increase the quality and relevance of tertiary education in a growing global information era. The goal is easier to implement as ICT and the Internet has developed rapidly as a potential for online course delivery platform and is relatively affordable and user-friendly. Many universities are embracing the technology and those institutions which seem slow in adopting the method may be left behind in the race for globalization, internationalization of higher education and technological development (Volery and Lord 2000).

The University of Botswana (UB) in its strategic plan deliberately adopted the use of ICT in the delivery of its academic programmes especially at undergraduate levels. The rationale for the development and integration of educational technologies in teaching and learning at the University was to fast track two priority areas in the University's 5-year strategic plan being: Priority Area 1: Expanding Access and Participation and Priority Area 2: Enriching Quality Academic Programmes through the infusion of ICT in teaching and learning. It is envisioned that the use of ICT based techniques will expand access and also enrich quality of academic programmes. To support ICT for instruction purposes at UB the executive management of the institution committed resources for the development and improvement of the learning and teaching environment. For example, technology–enhanced class rooms, smart classrooms and a video conferencing facility were installed and WebCT/Blackboard eLearning platform, proprietary software as opposed to free and open software was introduced. Additional and new technical and support staff were hired and lecturers were empowered through training e.g. short courses, seminars, workshops and conferences (Molelu and Uys (2003), Uys, Nleya and Molelu (2004), Giannini-Gachago, Molelu and Uys (2005)).

In the last 6 years, adoption of eLearning at UB seems to be encouraging as shown by the increasing numbers of staff who have developed online courses and a vibrant eLearning community has emerged. For example, by semester 1 of academic 2007/2008 about 450 online course modules had been created by academic staff, over 24 000 student seats had been added to online courses and 519 lecturers trained through various in-house eLearning workshops. There are, however, several issues and questions that need to be addressed. These include, but not limited to, students and staff's perception of the technology; capital and running cost provision;

system maintenance and availability; quality, standards and benchmarking; copyright, archiving and Curation of materials, and reward for developing online courses. The University is currently using a proprietary learning management software (LMS) i.e. Blackboard/WebCT which seems satisfactory for academic needs. However there are challenges due to escalation of the license fee, the long term sustainability of commercial LMS and also the implication of easy availability of free open courseware platforms.

There are three principal areas in any staff-student e-interaction namely the instructor, student and technology. Studies have been carried out on the perception of lecturers to the adoption and use of eLearning facilities (Mapoka and Eyitayo (2005), Shemi and Mgaya (2003)). The technology consists of the software, hardware and the learning environment and has a dynamic process of review and upgrade. Studies on students' perception to eLearning platform at UB are scanty. However Batane and Mafote (2007), Van der Merwe and Giannini-Gachago, (2005), Uziak (2008) have reported on students' perspective of eLearning. In particular the latter study is directly connected to the current paper and will be referred to more extensively in the next sections.

Methodology

An online questionnaire was designed as instrument for gathering data from a cohort of students enrolled in Mechanical Engineering level 300 course entitled solid mechanics. The third year of an engineering programme at UB is really the first year the students are spending in the cognate department but they would have used eLearning application at the lower levels of the programme. Level 200 is a Faculty of Engineering and Technology (FET) common year for all engineering and technology students and level 100 is a first year in the Faculty of Science spent with other science –based students.

The questionnaire consisted of three sections made up of 92 items that covered such areas as technology acceptance, resources, access, instruction, and quality issues. An open ended question enabled students comment on access to eLearning resources. A five-point Likert scale was used where respondents had to indicate the level of their agreement or disagreement to statements in which 1= strongly agree, 2=agree, 3=neutral, 4=disagree, and 5=strongly disagree. Although the questionnaire was designed for on-line electronic responses, hard copies were administered because the number of respondents in the study was limited. The instrument was administered at the end of the semester. All the 40 students who enrolled for the course completed the questionnaire and the responses indicated that they understood the questions and the overall objectives of the study.

Results and Discussion

Introduction
A pre-test questionnaire was administered to the students to identify and remove any ambiguities in the statements and also to ensure that respondents understood the purpose of the study which is to improve the use of online course delivery system through Blackboard. All the registered students participated in the study so there was 100% response. The questionnaires were well filled and none of the responses was discarded. Full details of the procedure for the use of Blackboard for course delivery reported in this paper can be found in Uziak (2008).

Technology Acceptance
The use of technology-based teaching and learning in tertiary institutions has been growing recently. Fig 1 shows that apart from Blackboard the students in this study use mainly the Internet (>80%) for educational purposes, followed by email, and sms. It is not surprising that the majority of students do not use the University Intranet may be because it is not fully developed or they are unaware of its educational potential. It seems the students are not technologically challenged as they are exposed to application of ICT for general academic purposes. For example, majority of the students do not feel threatened when others talk about use of Blackboard, and they are not nervous, stressful or uncomfortable to use the technology. This may be due to the fact that this is not the first time they are using eLearning platform.

Blackboard has many attractive features, menus and tools for teacher students' e-interaction. Fig 2 shows menus that were used by the students. All of them employed assignments as they were required to submit part of their continuous work through Blackboard. They did not use other tools such as chat, who's on line, my

grades, my progress and calendar for the course surveyed. This is probably because students were not directed to those menus and they did not explore other strengths offered by Blackboard.

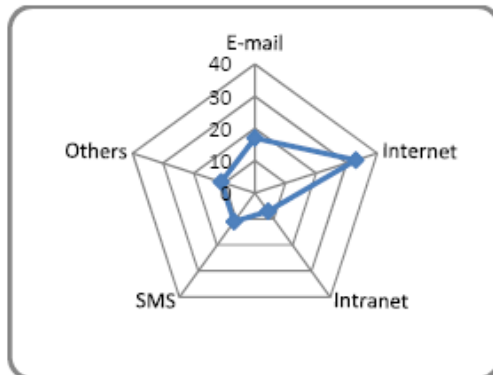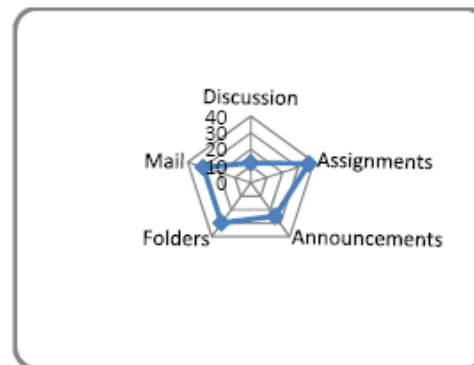Fig 1: Other technologies used by students for learning

Fig 2: Menus used in the Blackboard

A lot of technical resources and a plethora of other information are available online. Fig 3a shows that almost 50% and 25% of respondents respectively very often or often searched for information online. Majority of the students agreed that online searches improved the quality of their work. It seems that student-centred learning can be enhanced if students are empowered to make online searches individually.   Unfortunately the numbers of students who occasionally search for information or who agreed that online searches occasionally improve the quality of their work are still high.   From Fig 3b it can be observed that 12%, 20%, and 25% of students are neutral when asked if they are respectively comfortable, skilled, or efficient with using online resources. A staggering 45% of students are also neutral on whether online searching helps in doing assignments quickly and correctly. The results seem to corroborate observations of Brown and Peterson (2001) from EDDI consultancy on 'e-learning at UB and the Task Group on UB and Digital Scholarship (2008) who noted deficiencies in the current information literacy course at UB and then recommended that the course be re-modelled to equip students with skills for online searching and use of e-information for scholarly work and problem solving.

Access
The issue of access has several components including availability of computer space, ability to access Blackboard software, computer speed and system maintainability. Fig 4 depicts responses to statements on accessibility. Only 6 and 10 students indicated that they have enough access respectively to ICT facilities within the FET and UB main campus. It is pertinent to mention here that FET is a secondary campus of UB where facilities and services are concentrated. The study confirmed that computer availability is insufficient in both campuses. A recent survey showed that there are about 9 students to 1 computer (Task Group on Digital Scholarship, 2008) but UB is pursuing a strategy of personal computer ownership for both staff and students to ameliorate the situation. Fig 4 also shows that the students do not have enough opportunities to access Blackboard.

The students were presented with a statement on the system speed when they were able to access Blackboard. Thirteen (13), eleven (11), and sixteen (16) students in the cohort were respectively satisfied, unsatisfied, and unsure of system speed.   The response confirmed observation of staff that the system is too slow for many activities including eLearning and surfing the Internet.

The students were presented with a statement on whether the system works properly when they were able to access Blackboard. Majority of students were either not satisfied or were unsure of system performance. It is not uncommon for users to experience some technical problems due to ICT facilities rather than the Blackboard platform.

Finally the students were asked a question on who assisted them when faced with problems. Fig 5 shows that often colleagues and occasionally lecturers provided support for students. It is astonishing that many students never sought assistance from IT staff. Provision of 24/7 support for eLearning users is fundamental for success of using the technology. Technical support will be required at various levels of implementing eLearning strategy to prevent frustration of users and designers. As a first step, students would need training and be made aware of IT Help Line and other available IT services to increase participation in the eLearning endeavour.
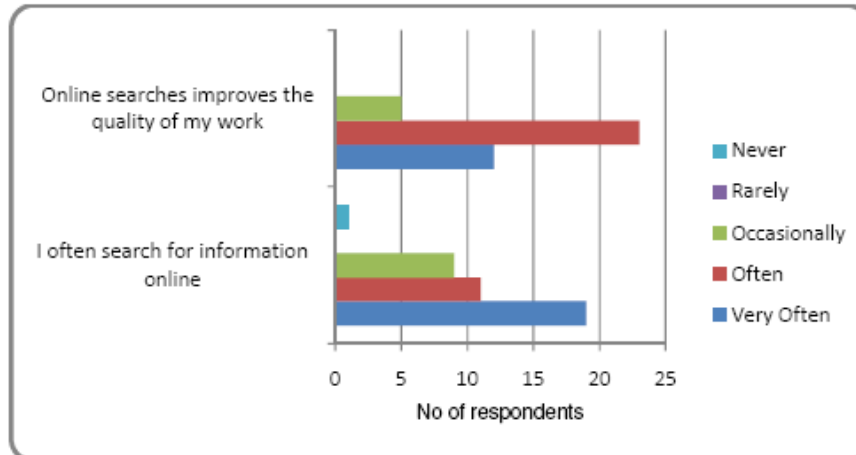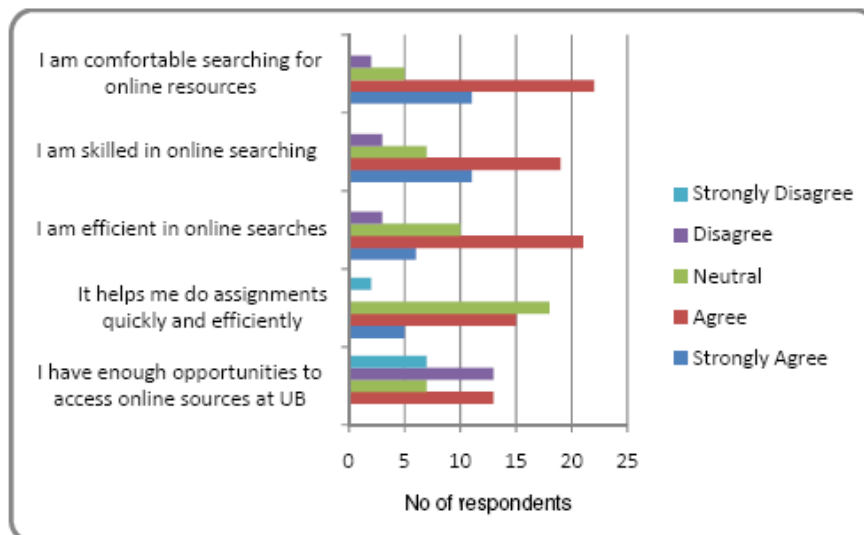
Fig 3a: Use of online searches

Fig 3b: Use of online searches

Instruction

Although the students have used eLearning in some other courses during their education this is the first study to evaluate the students' perception on the use of Blackboard course delivery. The students were presented with various statements to identify their preferences of modes of course delivery, Fig 6. It can be observed that majority of students did not prefer use of Blackboard alone but would rather accept the traditional chalkboard alone. It is interesting to note that they generally prefer any course delivery that included the traditional method. This seems to agree with the eLearning strategy adopted by UB to use blended method. Blended learning

incorporates many different learning styles including the use of virtual and physical resources e.g. a combination of technology-based materials and face-to-face sessions used together to present content (Wikipedia). In the UB context, the blended model refers to the use of eLearning to supplement the traditional face-to-face approach. It has several benefits over single mode approaches, some of which are (Uziak (2008) :

• improving teaching and learning by enhancing the strengths and reducing the weaknesses of each method.

• Extending the teaching and learning processes beyond time and place constraints of the physical classroom.

• Handling large classes more effectively than by traditional face-to-face only.

• Equipping students with certain critical skills and competencies (e.g. information literacy, ICT, social and communication) essential to live and function effectively in the 21st century, but are not easily transferrable through traditional face to face classroom interactions.

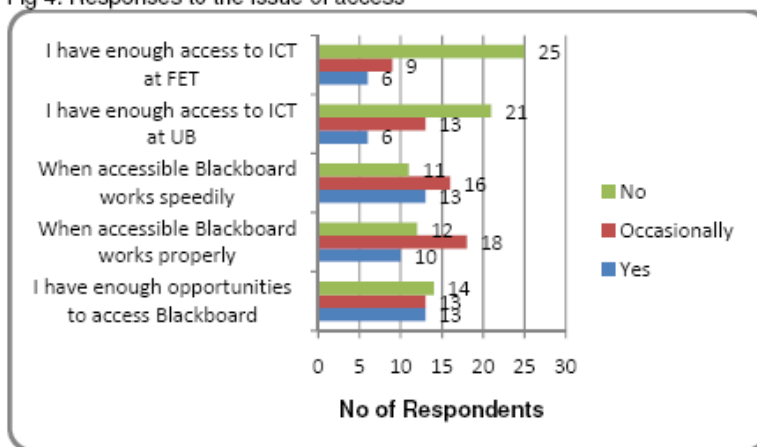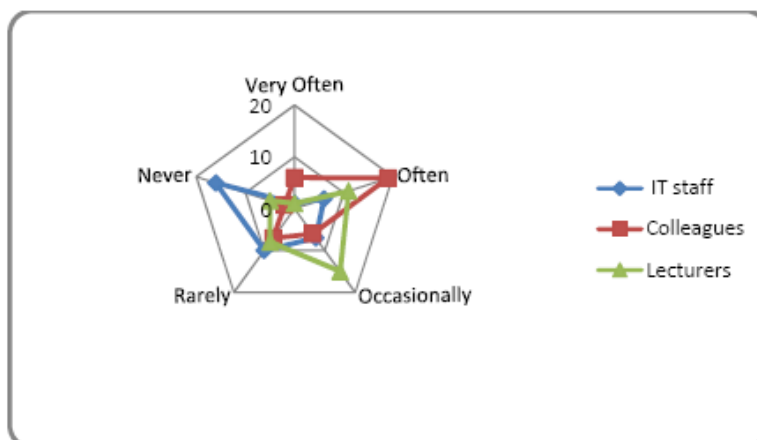Fig 4: Responses to the issue of access

Fig 5: Sources of support used by students

Overall Assessment

Students were presented with some statements to assess Blackboard learning management software. Majority of the students agreed that the technology generated interest in the course, enhanced learning and understanding of course material, provided useful feedback on assignments and improved interaction between

students and the lecturer. This may be due to the availability of course materials online which students can study at their convenience.

Finally they responded to a set of statements to determine skills, competencies or developmental knowledge gained through Blackboard, Fig 7.   A vast majority of the students agreed that Blackboard enhanced their IT skills (38 students), enabled them work effectively either individually (27) or in groups (23), helped meet deadlines (32) and assisted in keeping track of marks obtained in the course (35). These positive results may be due to the use of some tools in Blackboard which enabled students communicate more than traditional face-to-face approach. They are also forced to submit assignments on time as late submission may not be accepted by Blackboard. Infusing technology into both the course content and pedagogy can improve student learning and success. For example about 75% (30 students) agreed that Blackboard improved the quality of their studies.

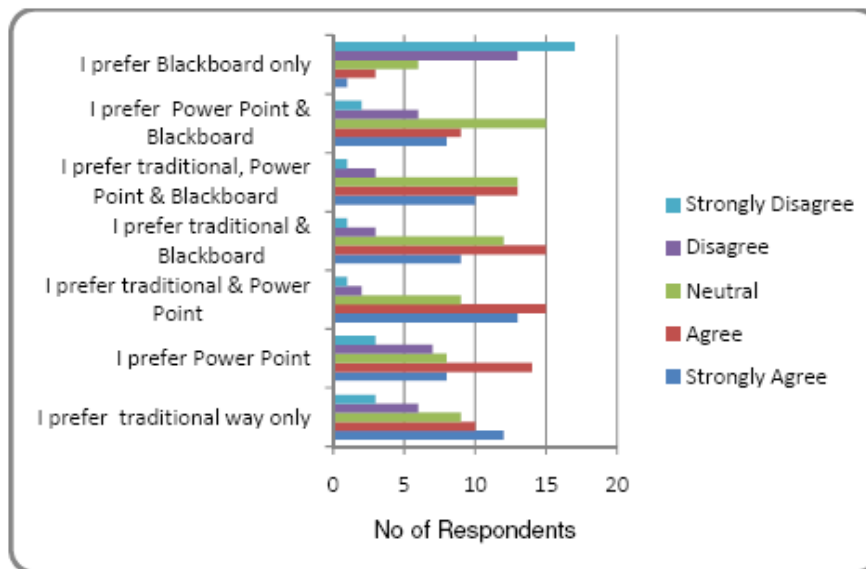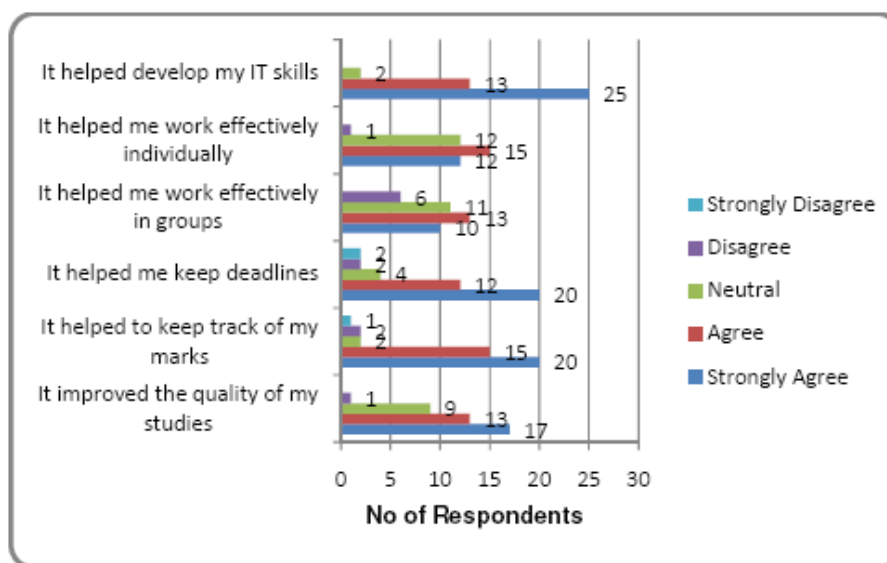Fig 6: Responses to modes of course delivery

Fig 7: Responses to developmental roles offered by Blackboard

The students were asked to rate the overall effectiveness of using Blackboard. Only 1 student rated the technology as being ineffective but other respondents rated it from fair (5 students), good (11), above average (13), to excellent (9 students), Fig 8. As the students surveyed seemed satisfied with Blackboard, the University will need to develop operational strategies to make more academics adopt use of Blackboard eLearning platform.

Fig 8: Overall teaching effectiveness of using Blackboard
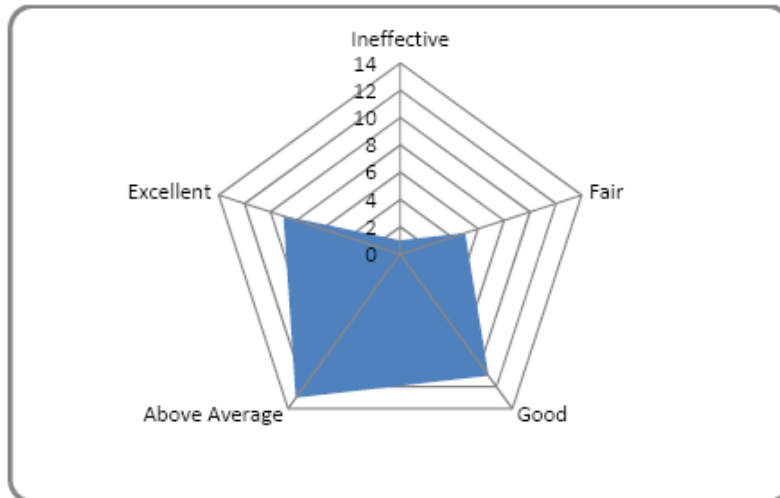
Conclusion

The University of Botswana has committed resources for the infusion of technology into the teaching and learning environment including using proprietary eLearning software (WebCT/Blackboard) as opposed to free and open software. The study surveyed a cohort of third year mechanical engineering students to obtain their perceptions about the use of Blackboard platform. Overall Blackboard course delivery enhanced students' engagement with lecturer, improved performance, and developed some positive skills and competencies in students. They were receptive to the use of the technology and the services were deemed convenient.

In view of the foregoing, more staff should be encouraged to provide blended eLearning delivery for their courses. Also a systematic evaluation of eLearning strategy must be developed. However, the study confirmed some challenges observed by earlier investigators (Batane and Mafote (2007), Uziak (2008)) in terms of limited access, insufficient technical support and narrow bandwidth. To enhance success of using Blackboard course delivery system, the University would need to provide more computers for students, increase bandwidth for faster access to Blackboard, offer more technical support and accelerate development of wifi connections around campuses to provide unlimited access.

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