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## ASSESSMENT OF E-LEARNING COURSE DELIVERY FOR MECHANICAL ENGINEERING STUDENTS AT THE UNIVERSITY OF BOTSWANA

**Abstract.** *The paper presents results of a study on students' perception of the eLearning technology, namely WebCT/Blackboard. The study was carried out at the University of Botswana (UB) during the first semester of 2007/2008 academic year. Several mechanical engineering courses were delivered using a blended method, i.e. online resource (eLearning) and traditional face to face approach. 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 to comment on other issues related to the course delivery. The paper discusses the challenges of using eLearning and proffers recommendations to ensure that the maximum benefit is derived from technological investment and staff effort. The results show that students were very receptive of ICT based course delivery.*

**Key words:** *ICT, eLearning, WebCT/Blackboard, access, mechanical engineering students.*

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### Introduction

Technology-based teaching and learning is entering into academic lives at an incredible rate. Many universities are embracing the technology and those institutions which seem slow in adopting may be left behind in the race for globalization, internationalization of higher education and technological development (Volery and Lord 2000). 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. The goal is easier to implement as ICT and the Internet are relatively affordable and user-friendly and have also developed rapidly as a potential for online course delivery platform.

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 classrooms, smart classrooms and 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 both the increasing numbers of staff who have developed online courses and emerging vibrant eLearning community. For example, by semester 1 of academic 2007/2008 about 450 online course modules had been created, over 24 000 student seats had been added to online courses and 519 lecturers were trained through various in-house eLearning workshops. There are, however, several issues and questions that need to be addressed. These include, but are 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 the educational needs. However, there are challenges due to escalation of the license fee, the long term sustainability of the 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 Eytayo (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 are scanty. However Batane and Mafote (2007), Van der Merwe and Giannini-Gachago, (2005), Uziak (2008) have reported on students' perspective of eLearning. The current study is the continuation of the latter the study.

### Methodology of Research

The study was carried out on a cohort of students enrolled in Mechanical Engineering BEng 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. The BEng programmes extend over ten semesters after entry with the 'O level' or eight semesters for those with 'A level' or Ordinary Diploma qualifications. Level 100 is a first year in the Faculty of Science, spent with other science-based students; whereas level 200 is a Faculty of Engineering and Technology (FET) common year for all engineering and technology students.

An online questionnaire was used as an instrument for gathering data from the 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 to 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. 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. The questionnaire was anonymous and did not have any influence on the students' marks. All the 40 students who enrolled for the course participated in the study so there was 100% response rate; 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).



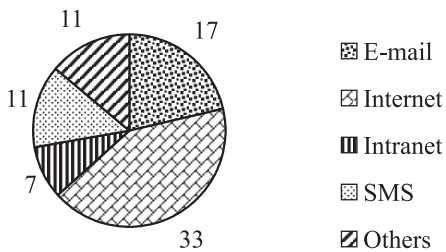
## Results of Research

The questionnaire allowed the students to comment on specific elements of the course delivery as well as on general issues related to eLearning platform. The results obtained for different aspects of the survey are presented below.

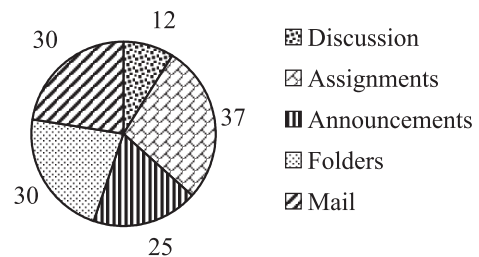
### *Acceptance and Use of Technology*

Blackboard was not the only ITC element for the students attending the course. Apart from Blackboard the students used mainly Internet (>80%), followed by email, and sms (Fig 1). It was not surprising that the majority of students did not use the University Intranet as it was not fully developed or they were unaware of its educational potential. It seems the students were not technologically challenged as they were exposed to application of ICT for general academic purposes before. For example, majority of the students did not feel threatened when others talked about the use of Blackboard, and they were not nervous, stressful or uncomfortable to use the technology. This may be due to the fact that it was not the first time they were 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-is-on-line", grade book, progress or calendar. This was mainly because students were not directed to those menus and they did not explore other strengths offered by Blackboard.



**Figure 1. Number of students using different technologies for educational purposes**



**Figure 2. Number of students using different Blackboard menus.**

A lot of technical resources and a plethora of other information are available online. Fig 3a shows that about 20 and 10 students respectively very often or often searched for information online. Majority of the students agreed that online searches improved the quality of their work. It proves that student-centred learning can be enhanced if students are empowered to make online searches individually. Unfortunately the numbers of students who only occasionally search for information or who agreed that online searches occasionally improve the quality of their work were still high. From Fig 3b it can be observed that 5, 8, and 10 students were neutral when asked if they were, respectively, comfortable, skilled, or efficient with using online resources. A staggering 18 students were also neutral on whether online searching helped them in doing assignments efficiently and correctly.



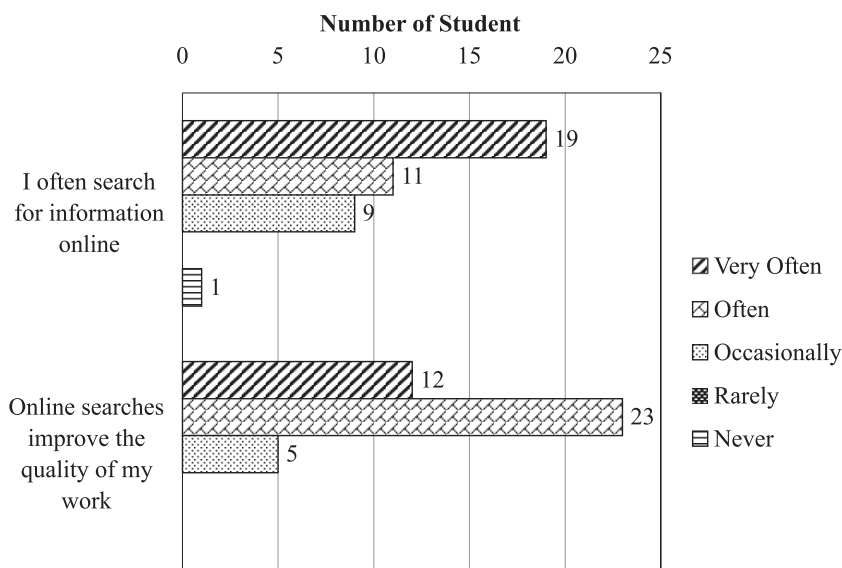


Figure 3a. Students assessment of the use of Internet.

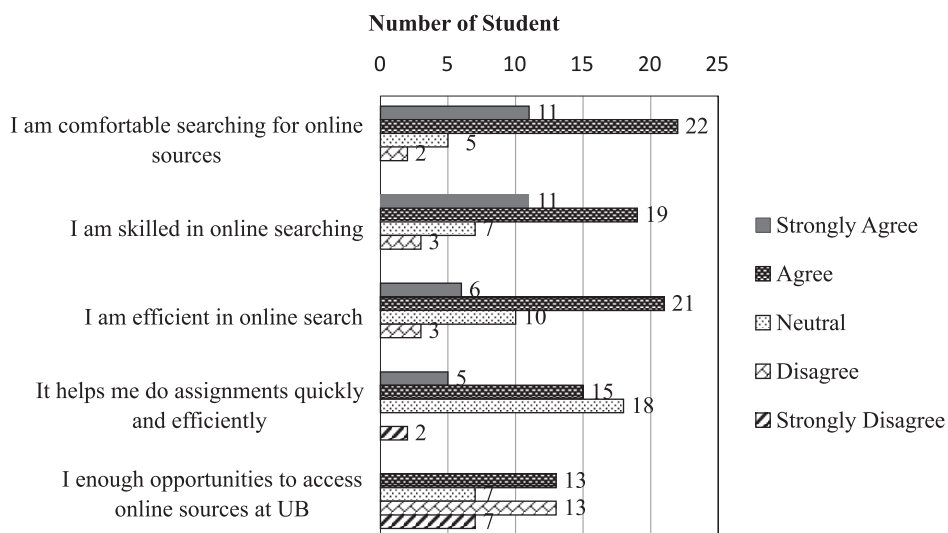


Figure 3b. Students attitude on their ITC related skills.

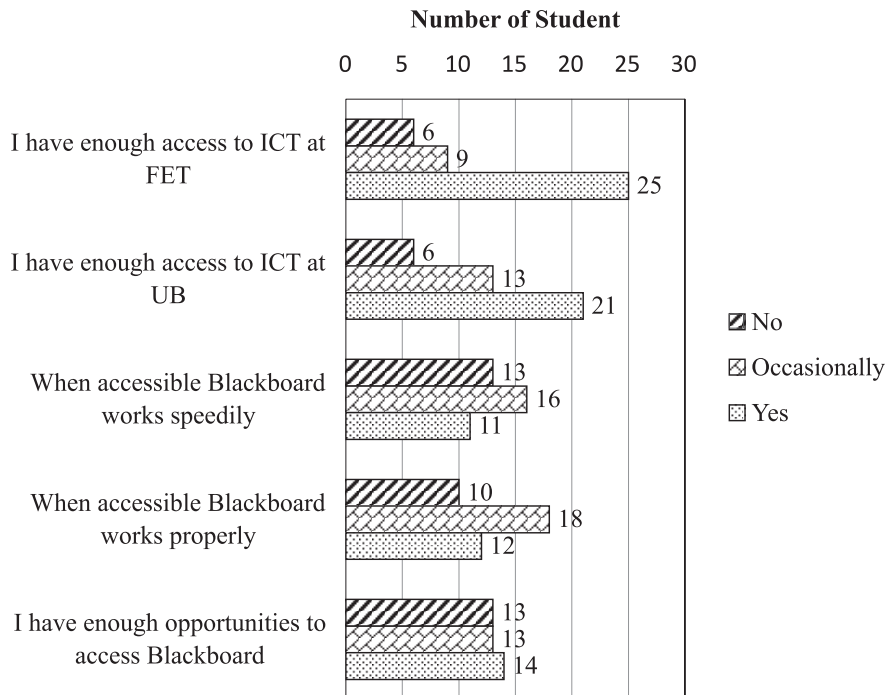
Access

The issue of access has several components including availability of computer space, ability to access Blackboard software, computer and network speed and system maintainability. Fig 4 depicts responses to statements on accessibility. Only 6 and 10 students respectively indicated that they had enough access to ICT facilities within the FET and UB main campus. It is pertinent to mention that FET is a secondary campus of UB and facilities and services are concentrated on the Main Campus. The study confirmed that computer availability was insufficient in both campuses.



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 students were also presented with a statement on whether the system worked properly when they were able to access Blackboard. Majority of students were either not satisfied or were unsure of system performance.

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.



**Figure 4. Students responses on issue of access.**

#### *Instruction*

Although the students have used eLearning in some other courses during their education this was 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, Figure 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 preferred any course delivery that included the traditional method.



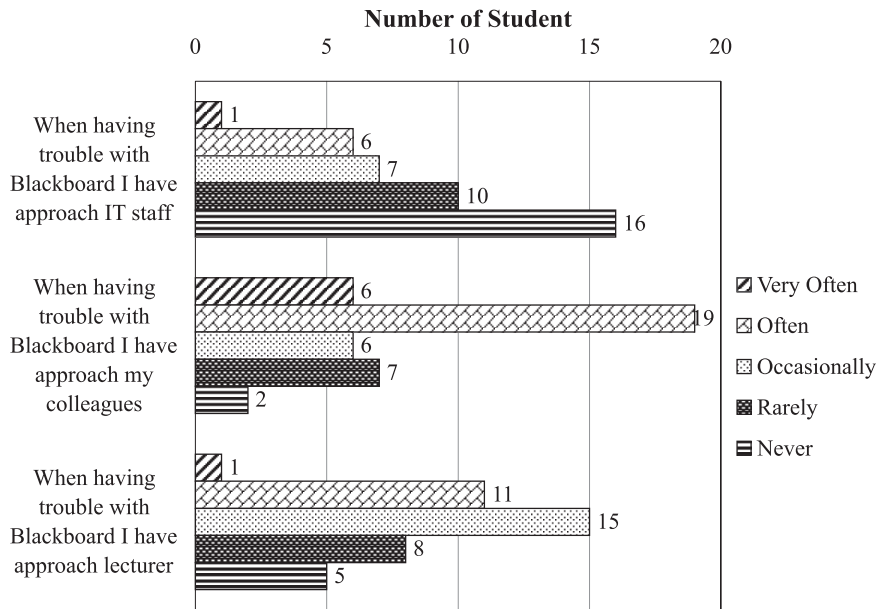


Figure 5. Students responses on sources of support.

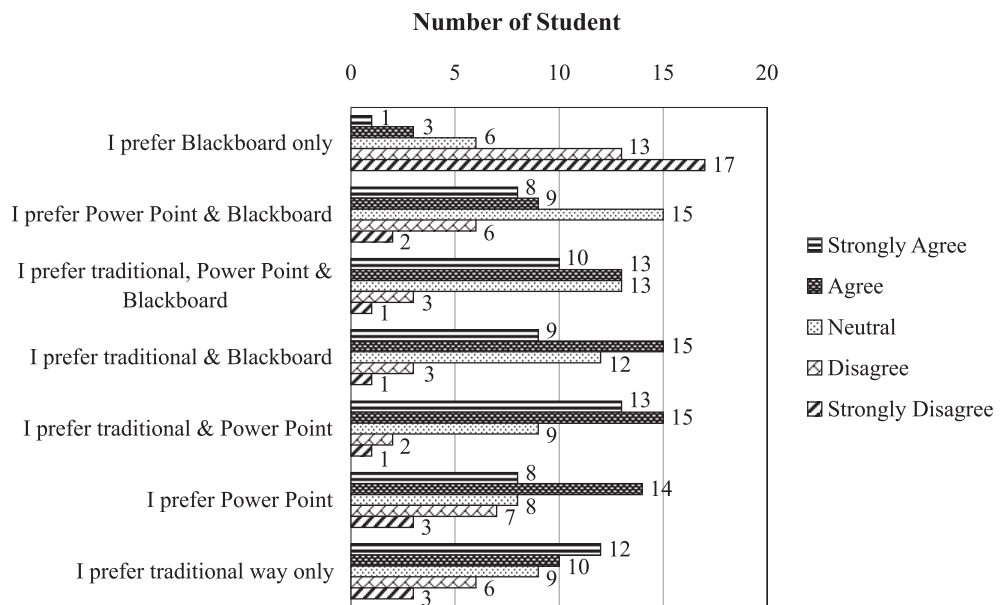


Figure 6. Students' responses on modes of course delivery.



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 was mainly due to the availability of course material online which students could study at their convenience.

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

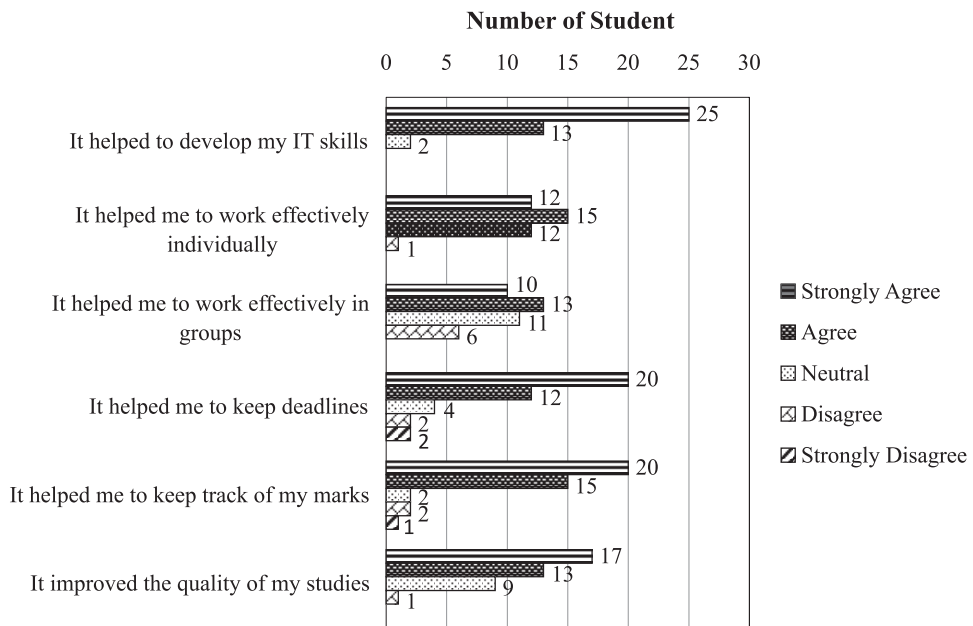
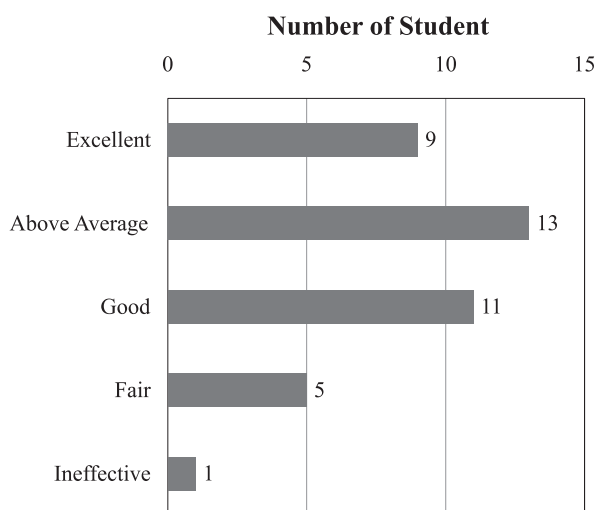


Figure 7. Responses to developmental roles offered by Blackboard.

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), Figure 8.





**Figure 8. Students assessment on overall teaching effectiveness of using Blackboard.**

### *Discussion*

The current study corroborated observations made by other researchers regarding the information literacy of students at the University of Botswana. In particular Brown and Peterson (2001) from EDDI consultancy on 'e-learning at UB and the Task Group on UB and Digital Scholarship (2008) 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. Now students themselves have also confirmed, as their evaluation on information skills was relatively low.

The study corroborated some challenges observed by earlier investigators (Batane and Mafote (2007), Uziak (2008)) in terms of limited access, insufficient technical support and narrow bandwidth. It reconfirmed the necessity of pursuing a strategy of personal computer ownership for both staff and students. That would ameliorate the current situation which a recent survey (Task Group on Digital Scholarship, 2008) estimated to be about 9 students to 1 computer.

It was not surprising that the students were of the opinion that the system was too slow for many activities including eLearning and surfing the Internet. It was also not uncommon for users to experience some technical problems due to ICT facilities rather than the Blackboard platform.

However, it was astonishing that many students never sought assistance from IT staff. Provision of 24/7 support for eLearning users was considered to be fundamental for success of using the technology. Technical support would 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 should be made aware of IT Help Line and other available IT services to increase participation in the eLearning endeavour.

The students were not very clear on their preferences of the mode of course delivery proving that actually there is no perfect and only method or style. Instead a blended approach adopted by UB eLearning strategy seems to be the most appropriate and suitable method for students. 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 listed below (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 approach 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, which are not easily transferrable through traditional face to face classroom interactions.

## 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. The students seemed satisfied with Blackboard and the University would need to develop operational strategies to make more academics adopt Blackboard eLearning platform. Overall Blackboard course delivery enhanced students' engagement with lecturer, improved performance, and developed some positive skills and competencies. They were receptive to the use of the technology and the services were deemed convenient. However, certain deficiencies in information literacy skills of students were noted.

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. 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.

## References

- Batane, T. & Mafote, S. (2007). The Impact of WebCT on Learning: A Student's Perspective. In *The Proceedings of the International Association of Science and Technology for Development (IASTED), Computers and Advanced Technology in Education - CATE*. Beijing, China. <http://www.actapress.com/Abstract.aspx?paperId=31896>. (Accessed on 18 Dec 2008)
- Brown, G. & Peterson, N. (2001). *E-Learning, the Library Learning Centre-Space & Strategies*. Consultative Report to the University of Botswana.
- Giannini-Gachago, D., Molelu, G.B, & Uys, P.M. (2005). Analysing the impact of introducing e-Learning in higher education within developing settings: the case of the University of Botswana. In Grabowska, A., Cellary, W. (Eds). *E-learning: experiences, cases, projects*. Poznan: The Poznan University of economics publishing house, pp. 29-38.
- Mapoka, K. & Eytayo, O. (2005). Staff views on the use of WebCT in teaching a computer literacy course: a case study of the University of Botswana. In: *Proceedings of the 35<sup>th</sup> Southern African Computer Lecturers Association (SACLA)*. Gaborone, Botswana:
- Molelu, G.B. & Uys, P.M. (2003). Development of eLearning at the University of Botswana: Challenges, Achievements, and Pointers to the Future. In. *Proceedings of eLearning Conference, MORUO Communications, Fourways*. Johannesburg, South Africa.
- Shemi, A. P. & Mgaya, K.V. (2003). Evaluation of Academics views on Information and Communication Technology diffusion in Higher Education: Botswana Perspective. In. Muuka, G. N. (ed.) *IAABD Conference Proceedings*, University of Westminster, London.
- Task Group on UB and Digital Scholarship (2008). *Final report of the Task Group on UB and Digital Scholarship*, University of Botswana, Gaborone, Botswana.
- Uys, P M. Nleya, P. & Molelu, G.B. (2004). Technological Innovation and Management Strategies for Higher Education in Africa: Harmonizing Reality and Idealism. International Council for Educational Media, EMI 41:1,



pp67-80. <http://www.globe-online.com/philip.uis/200303uystechnologicalinnovation.pdf> (accessed on 16 Dec 2008)

Uziak, J. (2008). Acceptance of Blackboard Technology by Engineering Students. In.: *Proceeding of Conference "University of Botswana and Digital Scholarship"*, Gaborone, Botswana.

Van der Merwe, M. & Giannini-Gachago, D. (2005). Imparting lifelong learning skills through e-learning in undergraduate students – Experiences at the University of Botswana. In. *Proceedings of the conference "What a Difference a Pedagogy Makes"*. Stirling, Scotland: The Centre for Research in Lifelong Learning.

Volery, T. & Lord, D. (2000), Critical success factors in online education. *The International Journal of Educational Management*, 14/5, 216-223 <http://www.essaybay.com/articles/linguistics4.pdf> (accessed on 18 Dec 2008)

Wikipedia [http://en.wikipedia.org/wiki/Blended\\_learning](http://en.wikipedia.org/wiki/Blended_learning) (accessed on 18 Dec 2008).

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