International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2005, Vol. 1, Issue 2, pp. 130-144.

Blended online and face-to-face learning: A pilot project in the Faculty of Education, Eduardo Mondlane University

Xavier Muianga
Eduardo Mondlane University Mozambique

ABSTRACT

This paper is about the introduction of blended online and face-to-face learning to the Faculty of Education at Eduardo Mondlane University (EMU) in Mozambique. The main objective of the intervention was to explore the use of a course management system (CMS) within a flexible, student-centred teaching and learning strategy. The author selected two courses, developed an implementation plan, and designed blended versions of the courses, which replaced much of the face-to-face contact teaching with online contact via a course management system.

This study is a part of a larger project to develop new teaching and learning methods for the new Education faculty and for EMU as a whole. The study includes a cost and benefit assessment and an assessment of the strengths and weaknesses of learning technologies. Project results include quantitative and qualitative information on the use of the CMS such as the access conditions of students and educators; student preferences across a range of activities; barriers to the use of computers; teaching and learning methods; the useability of the CMS as perceived by students; and barriers to the use of a CMS. The conclusion identifies institutional challenges, and offers recommended solutions to provide the human and technological infrastructure needed for effective implementation of a CMS across the university.

Keywords: *Course management system, online learning environment, acquisition and participation models, Mozambique, developing country, flexible learning*

INTRODUCTION

Mozambique's National Information and Communication Technology (ICT) Policy (2002) provides principles and objectives that will permit ICTs to be a driving force for national development and for better governance. Other goals are to contribute toward the country's increased participation in the global economy, to widen access to the information society and to convert the country from a mere consumer to a producer of ICTs. In this way it is the intention that ICTs contribute to the eradication of poverty and to the improvement of living conditions of Mozambicans.

Mozambique's national university, Eduardo Mondlane University (EMU), has a Strategic Plan (EMU 1998) which supports the application of ICT in education specifically order to support research and to improve teaching and learning. The plan specifies that

- The use of ICT can offer access to a wider student body across the country through the provision of distance education programmes;
- The use of ICT can offer opportunities to extend teaching and learning methods;
- ICTs can provide the basis for developing focused, profitable lifelong learning programme;
- ICTs can support the promotion of postgraduate programmes.

CONTEXT

Growing student numbers, increased student diversity and rapidly transforming technological and work practices have changed the relationship between universities and the wider community. The EMU, like many other educational institutions worldwide, has responded by identifying specific required graduate competencies. As part of this response, the Faculty of Education (FacEd) has adopted curriculum-based competencies that integrate ICT into teaching and learning.

Despite changes in the curriculum many faculties continue to use a traditional teaching and learning pedagogy that is characterised by an emphasis on face-to-face lectures. For self-study, the students use the library. The instructors lecture via the use of the chalkboard and textbooks, while the learners listen; sometimes the instructors use handouts or overhead projectors.

Most faculties are only in the very early phase of using computers to promote student learning. In some faculties both students and instructors have access to computers but from observation these are mostly used for administration, e-mail and to consult websites that not always have a clear relationship with the actual teaching and learning. Most instructors at EMU do not have experience in the use of computers for teaching and learning. They also lack the skills to teach in a student-centered way and have little experience of using methods/strategies that incorporate the use of ICT. Furthermore instructors have limited access to examples that illustrate the use of ICT in teaching their disciplines. Students are in a similar position; when the computer competencies of students were evaluated through a questionnaire more than 80% of the students answered that they had poor computer skills. These results demonstrate the need to integrate a basic computer skills module into the FacEd curriculum.

RESEARCH QUESTIONS

This paper sets out to demonstrate that new strategies of teaching and learning with ICT in the Faculty of Education at EMU can contribute to quality improvements in courses offered at EMU. This study is a pilot that can be used to provide recommendations for processes to roll out the use of ICTs in teaching on a larger scale across the university.

The central research questions for the study are:

1. Can the introduction of a course management system improve flexibility and reduce face-to-face teaching time at the Faculty of Education of EMU?
2. How does the adoption of a course management system affect courses in the Faculty of Education?
3. What kind of pedagogical model is best suited to the context of teaching and learning in the Faculty of Education?
4. Which framework is applicable to describe the costs and benefits of adopting a course management system in the Faculty of Education?
5. How can EMU prepare for an effective roll out of a course management system across the institution?

The effective use of ICTs in teaching and learning is facilitated by the use of an Internet or Intranet-based course management system. A WWW–based course-management system is an environment created on the World Wide Web in which students and educators can perform learning-related tasks (Jones & McCormack 1997). It is not simply a mechanism for distributing information to students; it also supports tasks related to communication, student assessment, and

course management. A WWW-based course-management system is a comprehensive software package that supports some or all aspects of course preparation, delivery and interaction and allows these aspects to be accessible via a network (Collis & Moonen 2001).

According to de Boer (2004) the overall aim of the intervention was to increase flexibility of course delivery and reduce the amount of face-to-face teaching by using the course management system to facilitate blended learning. “Blended learning is a way to design courses that blends different kinds of delivery and learning methods that can be enabled and/or supported by technology with traditional teaching methods (de Boer, p.17)”. The intervention itself had two elements: the implementation of a WWW-based course management system as a pilot project and the redesign of two Masters-level courses with the application of acquisition and contribution pedagogy (Collis & Moonen, 2001).

SELECTION OF A COURSE MANAGEMENT SYSTEM

The WWW- based course-management system used in the Faculty of Education in EMU is TeleTOP, which was developed by the Faculty of Behavioral Sciences at University of Twente in 1997. TeleTOP is a useable system that requires limited training of students and instructors. It includes multiple functions in an integrated system including News, Course Information, the Roster, Discussion, Questions & Answers, and Assignment Submissions. The University of Twente made TeleTOP available for the pilot project at EMU.

LITERATURE REVIEW

The combination of innovative, increasingly learner-centered pedagogy and new learning technologies inevitably has implications for the teaching and learning methods used at universities. According to Collis and Moonen (2001, p.9), flexible learning is related to a variety of forms to study used in higher education. They say that “students in higher education have for a long time chosen from a variety of courses, studied their textbooks in a variety of locations and times, and selected from a variety of resources in the library. Learning also takes place outside of explicit course settings, as students’ interaction with other or takes part in events such as guest instructors or debates and use built-in tutorials to help them how to use a software package.”

Flexible learning has a variety of characteristics that collectively differentiate it from other models of education. It can be mapped according to several dimensions such as time; content; entry requirements; instructional approach and resources; and delivery and logistics, as described in Table 1 below.

Table 1: Dimensions of learning flexibility: options available to learner

Flexibility related to time: Fixed time <==========> Times (for starting and finishing a course Times (for submitting assignments and interacting within the course) Tempo/pace of studying Moments of assessment	Flexible
Flexibility related to content: Fixed content <==========> Topics of the course Sequence of different parts of a course Orientation of the course (theoretical, practical) Key learning materials of the course Assessment standards and completion requirements	
Flexibility related to entry requirements Fixed requirements <==========> Topics of the course	
Flexibility related to instructional approach and resources	
Fixed pedagogy and resources <==========> Social organization of learning (face-to-face; group, individual) Language to be used during the course Learning resources: modality, origin, (instructor, learner, library, www) Instructional organization of learning (assessments, monitoring)	Flexible
Flexibility related to delivery and logistics Fixed place and procedures <==========> Time and place where contact with instructor and other students occur Methods, technology for obtaining support and making contact Types of help, communication available technology required Location, technology for participating in various aspects of a course Delivery channels for course information, content, communication	Flexible

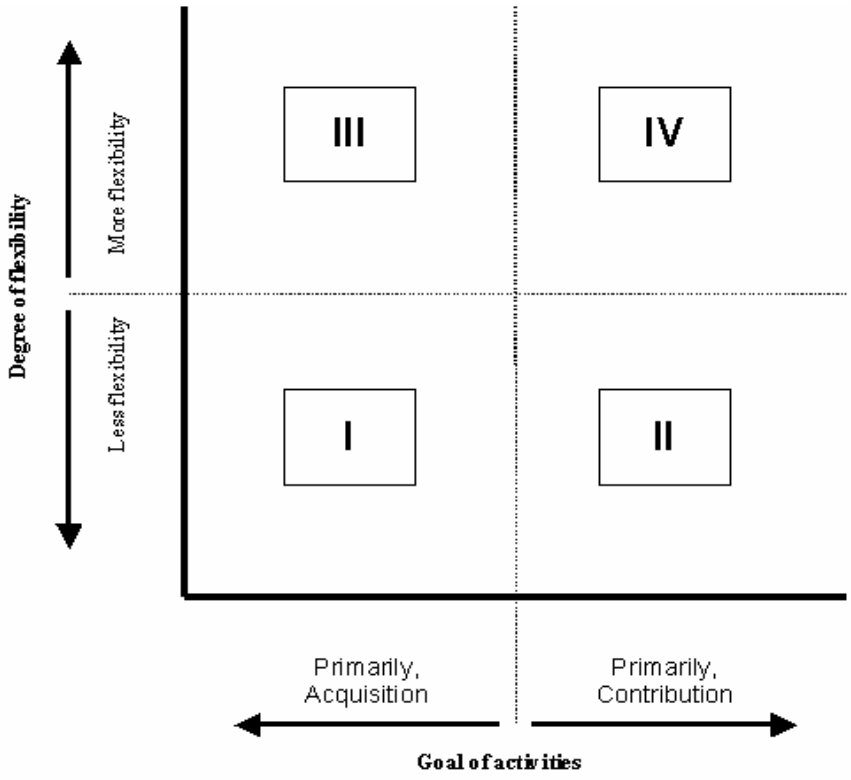
Source: Collis & Moonen 2001, p.10

EDUCATIONAL MODELS

Collis and Moonen (2001) differentiate between the acquisition model and the participation model of learning. The acquisition model is focused on learning activities that are pre-determined and are based on the acquisition of pre-specified knowledge by individuals, whereas the participation or contribution model is focused on learning activities where the student interacts and communicates with other participants and in a learning community. Because participation alone is not enough, contribution-oriented activities also play an important for learning in such an environment. Collis and Moonen (2001) suggest that both models should be reflected in pedagogy with more emphasis on contribution-oriented activities.

Collis and Moonen (2001) show the relation between flexibility and pedagogy by using the flexibility-activity framework that is similar to the ideas argued by Rich, Gosper, Love and Wivell (2001). By combining an educational model dimension with activity goals focused on acquisition or contribution with a flexibility dimension with categories relating to less and more flexibility, we can define a *flexibility-activity framework* (Collis & Moonen 2001), as shown in Figure 1. Rich et al. (2001, p.12) assert that "The student-centered approach underpinning flexible learning requires a different relationship between instructors and students than other models of education. There is less reliance on face-to-face teaching, often reserving such an approach for those circumstances where it is particularly valuable. There is more emphasis on guided independent learning; instructors become facilitators of the learning process directing students to appropriate resources, tasks and learning outcomes." This framework is used to describe the changes associated with the intervention in the Faculty of Education at EMU.

Figure 1: Flexibility-activity framework

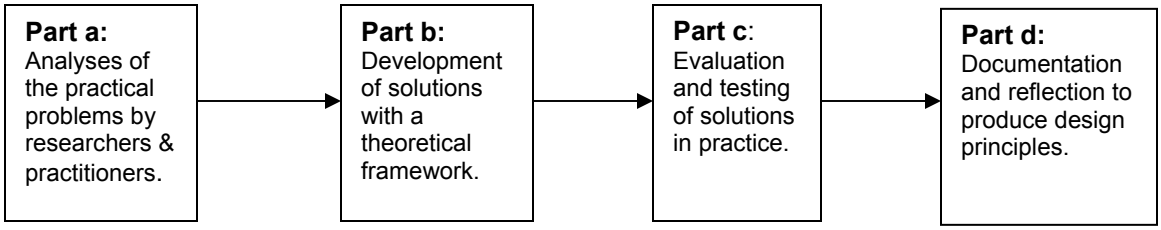


Source: Collis & Moonen 2001, p.24

METHODOLOGY

Reeves (2000) argues that research concerning the use of information technology in education is characterised by researchers with action goals that are focused on a particular programme, product or method, usually in an applied setting, for the purpose of describing it, improving it or stimulating its effectiveness and worth. The analysis of this case study draws on an adaptation of Reeves' development research model, as shown below in figure 2.

Figure 2: Adapted development research approach



Source: Reeves 2000, p.9

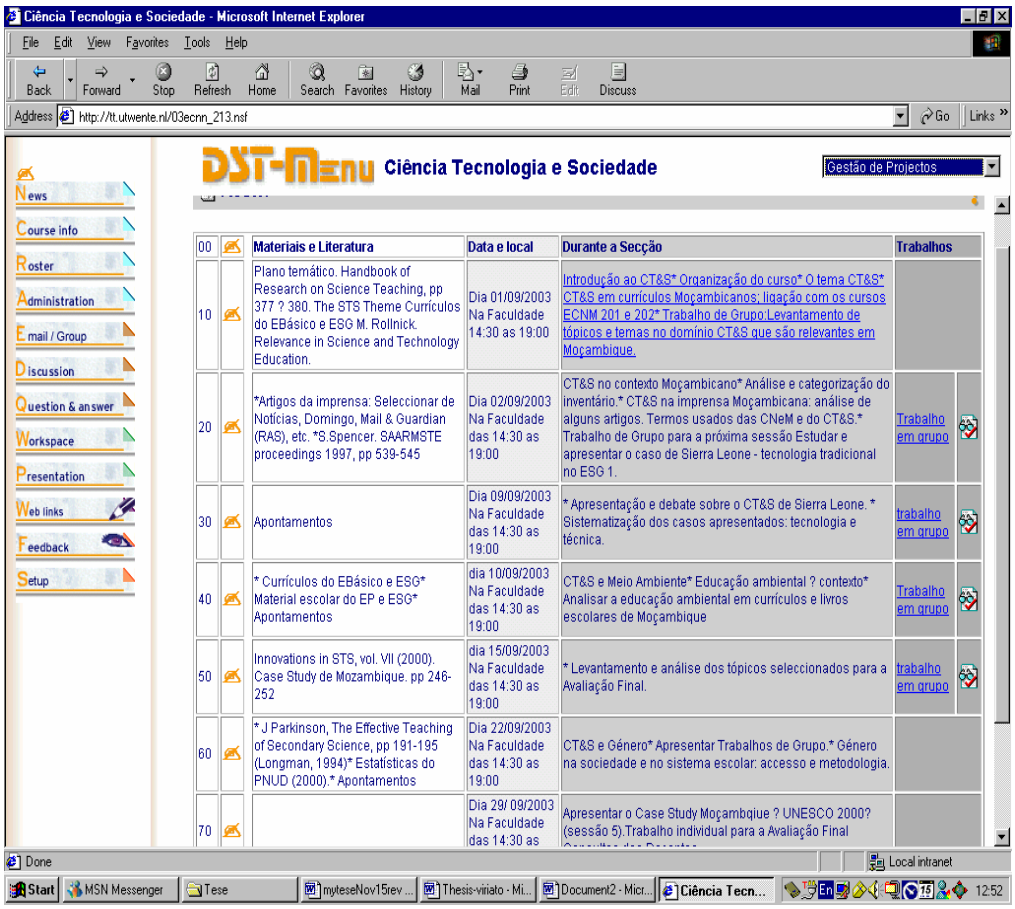
In the adapted model the feedback and redesign of the courses are not included since the study allowed only two months for the design of courses, implementation in TeleTOP, and data gathering.. Both qualitative and quantitative data were collected in this case study. Different methods of data collection were used. The research instruments used to obtain the relevant information for the study were: questionnaires for instructors and students; observations; discussions with instructors; analysis of TeleTOP sites, and some interviews.

A total of 22 questionnaires were returned from instructors and 52 were returned from students. The interviews were conducted only for some students and all instructors who were using TeleTOP in their courses. Notes from most of the interviews were written in an exercise book. The final evaluation questionnaire was distributed only for post-graduate students, n = 14, and all 14 were returned.

DESIGNS AND PLAN

Two Masters-level courses were selected for the intervention. The instructors and researcher decided to use the TeleTOP functions of News, Course Information, the Roster, Discussion, and Questions & Answers. The Roster was seen as desirable because it would allow students and instructors to submit assignments and because it takes account of the three cycles of learning – before, during and after an activity.

Figure 3: TeleTOP roster options*



** The English language interface of TeleTOP is not a problem for Mozambican higher education students who study English in secondary and higher education*

Training for instructors and students

The instructors and the students received training sessions of two hours in the use ofTeleTOP. These sessions were longer than would have been the case in a typical developed country because of poor Internet bandwidth at EMU (typically 120 b/ sec), which especially affects the use of sites with banners and Flash animation, both of which are used in TeleTOP.

The training for students was organised in three groups: 15 masters' students constituted the first group, while 57 graduate students constituted a further two groups. The group of graduate students was split because there are only 30 machines in the computer room.

Course design

The intervention was planned to introduce the use of a course environment in tandem with a shift towards a participation/contribution model of teaching and learning which would still include some aspects of the acquisition model. The implementation of TeleTOP required that the instructors redesigned their courses in order to reduce the number of face-to-face lectures and to introduce

more individual or group activities that required students' contributions within the course environment.

Table 2 below shows how the courses were designed to include a balance of acquisition and contribution activities in both TeleTOP and face-to-face interactions.

Table 2: Application of acquisition and contribution aspects in relation to flexibility

Component	To increase flexibility and support an acquisition model	To increase flexibility and support a contribution model
General course organization	- All announcements about the course procedures are posted in the TeleTOP News section. - A calendar is provided in the TeleTOP Roster with all relevant dates and times highlighted	
Lectures/contact sessions	- The traditional lectures and the contacts and unscheduled meetings. - Summary lecture notes are available in TeleTOP. - Students who were not at the session can review the instructor's notes, listen to the instructor explaining particular points (via contact asked by the students or e-mail), and can review the materials created and posted by the students who were present at the sessions.	- Interaction of the students with each other in a way that engages them in discussing the lecture material and articulating their ideas in a summary by using group work. - Extend the lecture after the contact and change to online-learning by having all students reflect on some aspect and communicate via some form of structured comment from the instructor via TeleTOP. - The instructor uses the students' input as the basis for the next session or activity. - Capture student debates and discussions and use as basis for asynchronous reflection and further discussion.
Self-study and exercises; practical sessions	- Exercises and guided self-study are now integrated with the contact sessions; all can be engaged in from wherever the instructor and student have network connections.	- Students can use each other's submissions as learning resources once these are available withinTeleTOP. - Communication and interaction via the TeleTOP site provides students with guidance as to how to respond productively to each other's work and questions. - Personal questions will be addressed via e-mail and other methods of capturing communication.
Feedback/testing/assessment of the assignments	- Feedback in a quick and targeted manner, without the student needing to wait to see the instructor face-to-face. - Feedback is posted in TeleTOP	- Peer – feedback
General communication	- TeleTOP has a group/ participant page listing all students and instructors profiles including their e-mail addresses.	- Discussions and question and answer activities about course topics within TeleTOP.

Source: adapted from Collis & Moonen 2001, p.21

RESULTS

This part of the paper shows results concerning student and instructor access to computers and the Internet; student evaluations of the two courses and the use of different TeleTOP features.

1) Student access to computers:

Table 3: Places where students have access to computers

	Masters	Graduate	Frequency	Percentage
Faculty	1	22	23	44.2
Faculty and outside EMU	13	16	29	55.8
Total	14	38	52	100.0

We note that:

- More than half of students have access to computers in faculty and in other places (for example, at home, at work, and in Internet cafés, 55.8%).
- In total of 14 master students, 13 have access in the faculty and outside EMU.
- Most of the graduate students only access computers in the faculty.

2) Student access to the Internet:

Table 4: Where students have access to the Internet

	Master	Graduate	Frequency	Percentage
Faculty	1	30	31	59.6
Faculty and outside EMU	13	8	21	40.4
Total	14	38	52	100.0

We note that:

- More than half of students access the Internet only in the faculty (59.6%).
- Of the total of 14 master students, 13 have access in the faculty and other places.

3) Instructor access to the Internet:

Table 5: Places where instructors have access to the Internet.

	Frequency	Percentage
Faculty	15	68.2
Faculty and outside EMU	7	31.8
Total	22	100.0

Most of the instructors depend on faculty computers (68.2%) and less than a third of instructors have access to the Internet outside EMU.

4) Feedback from Masters students concerning the use of TeleTOP:

Table 6: Feedback by Master students about the effects of using TeleTOP

	Disagree	**Neutral**	**Agree**
Improves the quality of the courses	p = 7.1 n = 1	p = 28.6 n = 4	p = 64.3 n = 9
More communication between students	p = 14.3 n = 2	p = 50 n = 7	p = 35.7 n = 5
More communication with instructors	p = 7.1 n = 1	p = 7.1 n = 1	p = 85.7 n = 12
Helps to be prepared for lessons	p = 14.3 n = 2	p = 14.3 n = 2	p = 71.4 n = 10
Gives more opportunities for feedback	p = 7.1 n = 1	p = 7.1 n = 1	p = 85.7 n = 12
Gives access to course information	p = 7.1 n = 1	p = 7.1 n = 1	p = 85.7 n = 12
More assignments before and after the classes	p = 7.1 n = 1	p = 35.7 n = 5	p = 57.1 n = 8
Leads to more activities during class hours	p = 7.1 n = 1	p = 7.1 n = 1	p = 85.7 n = 12
Students like to have TeleTOP support in more courses	p = 7.1 n = 1	p = 7.1 n = 1	p = 85.7 n = 12

Most Masters students agreed that working with TeleTOP improved their courses. Twelve of the 14 Masters students who completed the final evaluation questionnaire stated that the use of TeleTOP resulted in: improved communication with instructors; more opportunities for feedback from the instructors; improved access to course information; more learning activities during class hours; and improved course quality. The same 12 Masters students also demonstrated a preference for TeleTOP support in more courses and more regular use of TeleTOP for assignments before and after classes.

5) Impact on teaching and learning models:

With the basic infrastructure to support flexibility in time and place, students had the opportunity to work on assignments or tasks at times of their own choosing. Interactions within the period of the courses were completely flexible, except for the scheduled face-to-face contact with the instructor or other course participants and assignment deadlines. Thus the tempo or pace of studying was partly fixed.

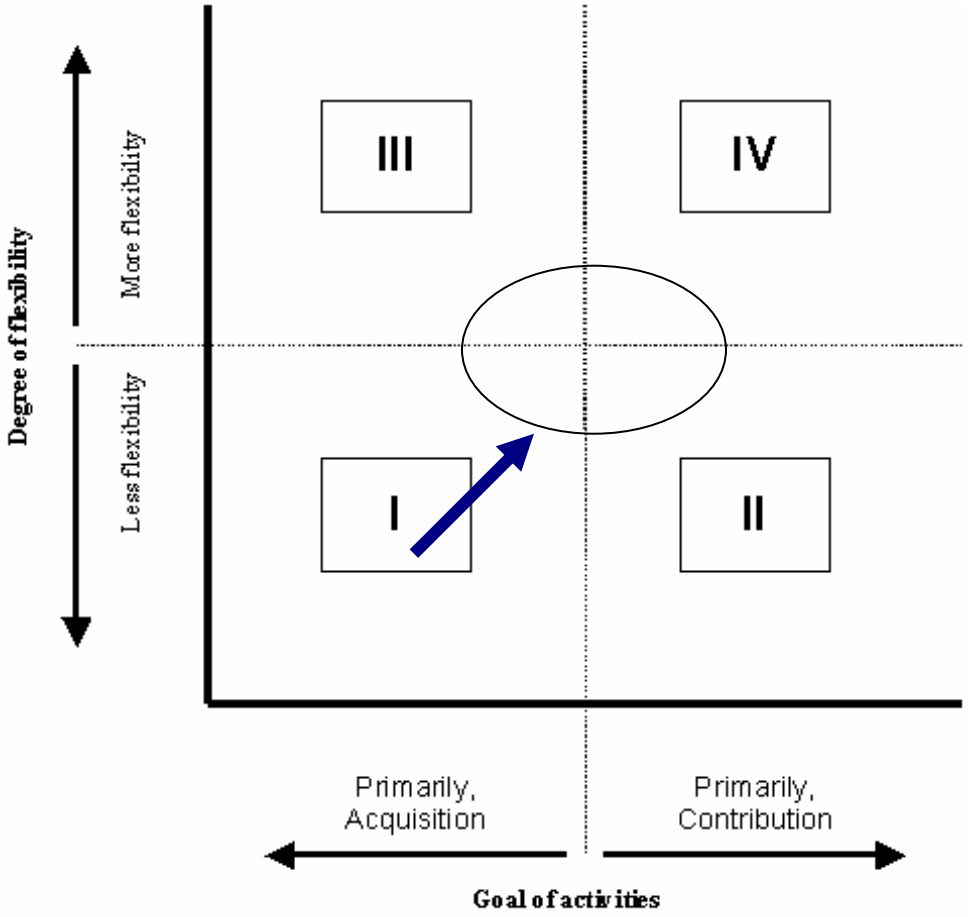
The social organization of the courses was quite flexible. There were face-to-face meetings of the whole class at the beginning and the end of the course as well as group work for some assignments and individual work for others. The learning resources were open, so that the students had to find their own resources for doing the tasks and assignments. This supported self-controlled learning. There was also an opportunity for using contributions by students but there were some difficulties in students uploading attachments.

One instructor made extensive use of classroom discussions and individual meetings at the expense of interaction in TeleTOP. The instructor of the second course made far more use of TeleTOP including more online discussion and feedback, and making online resources available to students. From a student perspective there were improvements in communication, feedback to

students and perceived course quality in both courses. The instructors were however cautious about changing their courses and preferred slow incremental changes to radical shifts in pedagogy and learning activities.

The acquisition and contribution models are well known in the Faculty of Education and fit well in a context in which one wants to build a competencies based curriculum (Kouwenhoven, 2003). The teaching and learning model chosen for the two course interventions involved students in the acquisition of skills and concepts and also in contributions to the growth of a learning community. This project has shown that many of the ideas for more flexibility and student contributions were realized despite the limited use of flexible communication within TeleTOP.

Figure 4: Flexibility-activity framework with position of the actual situation of two courses applied in TeleTOP



The findings of the investigation shows that the two courses in the Faculty of Education moved to a position from the first to the third and partially to the fourth quadrant of the flexibility figure as shown in Figure 4. The shift to quadrant four relates to an increase in both flexibility and the use of the contribution model. We agree that flexibility and contribution are important aspects to generate an effective implementation but also suggest that acquisition elements are still needed.

COST AND BENEFITS

Table 7 applies the Simplified Return on Investment (ROI)-model (Moonen, 2002) from an efficiency perspective. In this table some relevant items regarding to quality perspective are mentioned in the first column. The last three columns indicate ROI scores from the institutional, instructor, and student perspectives. A weighting factor is mentioned in order to represent the importance of each item per actor as reliably as possible. The data in the cells (on a scale from –10 to +10, indicating 100% loss to 100% gain) represents the relative amount of loss or gain that was perceived by the respective actors in the new situation when using the course management system in comparison with the original traditional situation. Some of the remarks made are used in the table to clarify the score given by the researcher.

The results as shown in Table 7 suggest that the introduction of the learning management system has improved efficiency from institutional, student and instructor perspectives.

From an economic perspective, there are some investments and yearly costs. In the case of this pilot intervention the costs were quite high in relation to the efficiency gains. For future projects including a faculty or university wide roll-out far higher gains of quality and efficiency are expected. EMU has an Informatics Center (CIUEM), which offers ICT services. One of the main recommendations of this study is that EMU should buy or to licence a WWW-based course management system and host it in this centre. The infrastructure for introducing new e-learning is already there, hence a big amount of investment for it could be saved. Another point to consider is that EMU's part-time students urgently need flexibility because of their full-time work commitments.

Table 7: Simplified ROI with respect to efficiency

Actors:	**Institution**		**Instructor**		**Students**	
Items:	**Weight**	**Score**	**Weight**	**Score**	**Weight**	**Score**
Flexibility	1.0	+5 Can serve students at a distance*	1.0	+5 Can work on the course outside of the faculty or when traveling, don't have to be in the faculty all time* **	.8	+3 Time can be used more efficiently, don't have to come to lectures all afternoon, but it is necessary to work at a computer***
Studying course content via TeleTOP					0.6	+2 Since the course itself is teaching users to use e-learning system, so the TeleTOP system will be more efficient* ** ***
Efficiency in terms of student results	1.0	+5 Students will stay on tempo, finish the course on time *	1.0	-4 Will cost much more time to look at & give feedback on all the extra assignments, handle e-mail, etc * ***		

Table 7 (continued): Simplified ROI with respect to efficiency

Actors:	**Institution**		**Instructor**		**Students**	
Items:	**Weight**	**Score**	**Weight**	**Score**	**Weight**	**Score**
Finding information & literature on line	0.8	+2	0.8	+2 Information, also via TeleTOP, will always be available****	0.6	+2
Doing and submitting assignments					1.0	+3 Saves time and is handy, and according to the content of course, it would be better to do assignments in web environment * **
Assessing assignments and giving feedback			0.8	-3 Easier & faster to give feedback with a red pen, directly on paper*		
Feedback on assignments via web-based system			1.0	+1 Despite above, it is handy to give feedback directly into the TeleTOP*	0.8	+1 Good that you can read feedback, even at outside of the faculty, as soon as the instructor puts it there***
Communication	0.6	+2 Can get information about what users need faster*	0.8	+2 More communication with students**	0.8	+2 More communication with instructors**
Support of group work			0.8	-2 Much better if students do it face-to- face*	0.6	-2 Easier to get together face-to-face*
General information about the course available on TeleTOP	0.6	+1 Will be useful**	0.8	+1	0.8	+2 Will be up to date and useful**
Technology skills and competencies	0.8	+2 Everyone will benefit from having more technology experience*	0.8	+2 Will become more effective with the computer since using web-based approach*	0.8	+2 Will improve your skills at using the Internet*
ROI: Efficiency		15.4	3.6		12.2	

Source: adapted from Moonen, 2002

Notes: * Information from the investigator observations
** Information from questionnaires
*** Information from discussion with instructors
**** Information from TeleTOP data.

CONCLUSIONS

On the basis of this study a number of conclusions were reached.

Firstly, with regards flexibility and face-to-face teaching time, the interventions in these two Masters-level courses resulted in improvements in flexibility in place and time; flexibility related to content; flexibility related to instructional approach; and flexibility related to delivery and logistics. In both of the courses the time spent in face-to-face lectures was reduced. The students used their access to computers in the faculty and outside EMU to engage flexibly in learning and assessment activities beyond scheduled face- to-face meetings.

Secondly, it was noted that course changes resulting from the use of a course management system were varied. The instructors were cautious about changing their courses. Only one of the two instructors made extensive use of TeleTOP. However from a student perspective the increased flexibility and access to online resources and communication resulted in changes in communication patterns, feedback to students and a perception of improved course quality in both courses.

Thirdly, it was noted that the combination of contribution model and acquisition model fits best in this context. The combination of increased flexibility and a shift towards contribution activities is likely to be of greatest benefit to part-time students.

Fourthly, with regards costs and benefits, it was possible to demonstrate efficiency gains from institutional, instructor and student perspectives. It was also observed that a far higher return on investment could be achieved through the use of a learning environment on the EMU network.

Finally, in order to gain maximum benefit from the roll-out of a course management system across EMU several changes will be needed. At a technical level these include improvements in local network capacity, internet connectivity and IT support systems. Access speed and cost of bandwidth both offer strong arguments for the use of a course management system on a local EMU server. Finally there is a clear need for staff development activities to ensure that instructors are confident in the use of the technology and able to design and lead activities based on a contribution model.

REFERENCES

Collis, B., & Moonen, J. (2001), *Flexible learning in a digital world*, Kogan Page, London.

De Boer, W. F. (2004), *Flexibility Support for a Changing University,* Thesis, University of Twente, Enschede.

EMU (1998), S*trategic Plan, 1999–2005*. UEM, Maputo.

Jones, D., & McCormack, C. (1997), *Building a Web-based education system,* John Wiley and Sons, New York.

Kouwenhoven, W. (2003), *Designing for competence in Mozambique: Towards a competence-based curriculum for the Faculty of Education of the Eduardo Mondlane University.* PhD thesis, University of Twente, Enschede.

Reeves, T.C. (2000), *Enhancing the worth of instructional technology research through "design experiments" and other development research strategies*. Paper presented at the annual meeting of the American Educational Research Association, New York.. Available at: http://it.coe.uga.edu/~treeves/AERA2000Reeves.pdf. Accessed October 2003.

Rich, D., Gosper, M., Love, P., & Wivell, C. (1999), *Flexible learning plan 1999–2002,* Macquarie University, Australia. Available at: http://www.cfl.mq.edu.au/html/flp/flp.rtf. Accessed August 2003.

Original article at: http://ijedict.dec.uwi.edu//viewarticle.php?id=85&layout=html