Chapter 14

Impact of Collaborative Course Design on Instructors' Practices and Students' Academic Outcomes

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Introduction

The Open University of Tanzania (OUT) is a distance education institution that has made a significant progress towards integration of e-learning for delivering its programs and courses. When it started in the 1990s, OUT used postal services and its own transportation to reach students in regional centres at the beginning of the academic year. A study by Nihuka and Voogt (2011) conducted at OUT indicated that such a practice is associated with challenges such as delays in the delivery of course outlines and study materials, lack of regular interactions between instructors and students, delays in or lack of feedback on student learning, and feelings of isolation among students. Encouragingly, studies have shown that e-learning technologies have the potential to (i) enrich delivery of courses and learning resources (Bates, 2000; Pena-Bandalaria, 2007), (ii) facilitate access to learning resources, (iii) alleviate feelings of disconnectedness by improving interactions between instructors and students (Fozdar & Kumar, 2007; Ludwig-Hardman & Dunlap, 2003; Thomas & Carswell, 2002 and (iv) provide feedback and support to students (Ludwig-Hardman & Dunlap, 2003; Pena-Bandalaria, 2007). E-learning technologies also have the potential to improve students' academic outcomes (Bates, 2000).

Although e-learning has potential, the implementation of such technologies in most universities in sub-Saharan Africa is still very low (Hoven, 2000; Sife, Lwoga, & Sanga, 2007; Siritongthaworn, Krairit, Dimmitt, & Paul, 2006). According to Sife et al. (2007), one of the major barriers to e-learning implementation is a lack of systematic approaches to the preparation of instructors for e-learning course design and implementation. Taking OUT as an example, instructors' preparation for the use of e-learning has been predominantly provided through workshops that have

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shown to be ineffective (Bakari, 2009). As a result, for many years, instructors at OUT have continued to deliver their courses using the traditional print-based mode with limited integration of e-learning technologies, despite significant investment.

An effective professional development arrangement involves instructors actively, includes reform-oriented activities that are sustained over time, and provides follow-up support and opportunity for collaboration (Desimone, Porter, Garet, Yoon, & Birman, 2002; Penuel, Fishman, Yamaguchi, & Gallagher, 2007; Simmie, 2007). Several studies have demonstrated that *collaborative course design*, as a strategy for the professional development of instructors, is effective in improving instructors' skills for e-learning course design, e-learning technology implementation, and pedagogies (Mishra, Koehler, & Zhao, 2007; Voogt, 2010).

In this study, *collaborative course design* strategy was used at OUT to prepare instructors for e-learning course design and delivery. According to Nihuka and Voogt (2011), *collaborative course design* enables instructors to transform their print-based courses into e-learning courses, which are then delivered via Moodle LMS and supported by e-mail and mobile phones. In order to investigate the impact of *collaborative course design* on instructors' practices, instructors were allowed to offer/deliver the courses to students for 12 weeks. Further, students enrolled in the courses were oriented as to how to learn in this new environment and access the courses offered in Moodle LMS. This chapter discusses results for (i) the impact of collaborative course design on instructors' instructional practices and (ii) the impact of e-learning delivery on students' academic outcomes.

E-Learning Implementation in Distance Education

Challenges of E-Learning Implementation

In most of sub-Saharan Africa's universities, the implementation of e-learning technologies to enhance distance education is limited (Dzakiria, 2004; Ludwig-Harman & Dunlap, 2003; Mcharazo & Olden, 2002). This is because most universities are confronted with challenges such as (i) perceptions about e-learning technologies (Bakari, 2009; Phillips, 2005; Siritongthaworn et al., 2006), (ii) access to infrastructure (Aguti & Fraser, 2006; Nnafie, 2002; Resta & Laferriere, 2008), (iii) narrow bandwidth (Gakio, 2006) and (iv) limited skills and competence for use of e-learning technologies on the part of both instructors and students (Hoven, 2000; Kirkwood & Price, 2005).

Instructors' perception about e-learning technologies is one of the challenges for successful e-learning implementation in distance education (Bakari, 2009; Siritongthaworn et al., 2006). According to Bakari (2009), some instructors do not perceive e-learning as an effective means for teaching and learning. The perceived

benefits of a particular technology have great influence on instructors' decision on whether to use the technology or not. In addition, beliefs about teaching and learning held by instructors are also among the important challenges that influence e-learning implementation in their courses (Phillips, 2005).

Access to the ICT infrastructure is another serious challenge. Only 4% of the African population have access to and use computer and internet (Resta & Laferriere, 2008). Despite the fact that availability of mobile phones for educational uses has enjoyed phenomenal growth across Africa (Pena-Bandalaria, 2007), the effective use of this gadget is also to some extent limited by challenges such as cost (Nnafie, 2002), limited screen size, battery life, memory and design of content for m-learning delivery (McGreal, 2009). In sub-Saharan Africa's universities, studies have shown that access to different e-learning technologies differs between instructors and students (Aguti & Fraser, 2006; Nnafie, 2002). For example, Aguti and Fraser (2006) reported that more than 60% of the students in their study lacked access to video, computer and internet.

Narrow bandwidth that affects internet speed is another big challenge in most sub-Saharan African countries. According to Gakio (2006), the state of internet connectivity in tertiary institutions in Africa is characterized as: *"too little, too expensive and poorly managed; as a result internet technology becomes even less useful for research and education purposes"* (p. 41).

Limited competence and skills on the part of both instructors and students is also a challenge for implementation of e-learning technologies (Hoven, 2000). A large proportion of instructors and most students have limited competence and skills in using new technologies (Hoven, 2000). Instructors and students with poor computer competences and skills perceive e-learning technologies use as difficult, compared to those with good competence and skills for computer use (Siritongthaworn et al., 2006).

Instructor-Student Interaction Through E-Learning Technologies

Among other uses, e-learning technologies are used in most developed countries to enhance interactions among instructors and students (Dabbagh & Kitsantas, 2005) and for providing feedback to students (Dunn & Lingerfelt, 2004; Malikowski & Theis, 2006). Increased interactions as a result of application of e-learning technologies lead to increased student satisfaction, retention and graduation rates in distance education (Malikowski & Theis, 2006). E-learning technologies such as e-mail are also useful for providing feedback to students in the form of instructors' comments (Malikowski & Theis, 2006). Moreover, students find interactions through e-mail communication interesting and useful for

exchanging information among themselves and between themselves and instructors (Dabbagh & Kitsantas, 2005).

Course Delivery, Access and Academic Outcomes

E-learning technologies such as learning management systems are commonly used to deliver courses and learning resources to students (Dunn, 2004). According to Malikowski and Theis (2006), course delivery by a learning management system provides convenient, individualized and high-quality instruction. E-learning technologies enhance students' access to learning resources as well (Dunn, 2004; Papastergiou, 2006).

In terms of improving students' academic outcomes through e-learning implementation, the existing studies provide mixed evidence. Although Bates (2000) reported significant improvements in students' academic outcomes as a result of the application of e-learning in teaching and learning, a study by Summers, Waigandt, and Whittaker (2005) reported no significant difference in outcomes between e-learners and traditional instruction groups. Summers et al. (2005) found that in order for students to benefit from e-learning technologies, instructors need to organise courses such that they adequately take the following into account: (i) course task characteristics, (ii) student characteristics, (iii) student motivation, and (iv) instructor characteristics. Summers et al. (2005) further argued that when those attributes are not taken into consideration, students are likely to experience fewer benefits from e-learning.

Purpose of the Study

The purpose of the study reported in this chapter was to investigate the impact of *collaborative course design* on instructors' practices and students' academic outcomes at the Open University of Tanzania (OUT). The main question was formulated as: *What is the impact of collaborative course design on instructors' instructional practices and students' academic outcomes?* The following sub-questions guided the study:

1. In what ways did collaborative course design contribute to instructors' preparedness for e-learning implementation?
2. How did the instructional practices of instructors change during e-learning implementation?
3. How did students experience e-learning implementation?
4. What was the impact of e-learning implementation on students' academic outcomes?

Intervention

The professional development intervention involved collaborative course design and delivery. Collaborative course design consisted of workshops, the redesign of courses in design teams, and general meetings of the design teams. The redesigned courses were then delivered. During course delivery the general meetings continued. Instructors from the Faculty of Science, Technology and Environmental Studies (FSTES) and from the Institute of Continuing Education (ICE) were invited to participate in two workshops (one prior to course design and one at the end of course design).

The first workshop, which lasted for 3 h, aimed to prepare instructors for how to redesign their print-based courses into e-learning courses. It also oriented instructors regarding e-learning course design, particularly how to plan and write different materials for e-learning courses (e.g., preparing PowerPoint slides, searching for resources, lesson notes, and study materials, etc.). The workshop used presentations and demonstrations of exemplary e-learning courses that had been developed during a pilot study to stimulate discussions on course redesign. Two instructors acted as facilitators during the workshop.

After the first workshop, instructors worked in design teams to redesign their courses. The emphasis was on redesigning existing courses rather than developing new ones. Instructors spent 2.5 months on redesigning their courses. Five general meetings were convened for the teams where questions were answered, topics discussed and choices made. The general meetings provided the design teams with opportunities to discuss different challenges, issues and problems related to the course redesign process. Pedagogical support was provided to the design teams in the general meetings.

A final workshop lasting 2 h was convened after all e-learning courses had been developed to orient instructors regarding e-learning course delivery and how to use e-mail and mobile phones to interact with students during the course. The redesigned courses were then delivered to students at the regional centres through Moodle LMS. Twelve courses were installed in Moodle LMS in a computer laboratory at the Dar es Salaam, Singida and Manyara regional centres. During implementation of the redesigned courses, four general meetings were convened for instructors to reflect about the on-going course delivery. The courses were delivered over 12 weeks.

Methods

Design of the Study

To answer research questions 1 and 2, a *multiple case* research design (Yin, 2003) was employed. Two cases, that is, the Faculty of Science, Technology & Environmental Studies (FSTES) and the Institute of Continuing Education (ICE),

were explored during the study. Instructors involved in the study were considered as the units of analysis and OUT as the context of the study. The same design was used to collect data from students to answer research question 3. In this respect, three cases (i.e., the Dar es Salaam, Singida and Manyara regional centers) were considered and students involved in the study were regarded as the units of analysis. To answer research question 4, a quasi-experimental research design was employed. Students at the Dar es Salaam, Singida and Manyara regional centers were assigned to experimental and control groups. Students were purposefully assigned to the experimental and control groups. The criteria of geographical location, knowledge about and access to computers and internet were mainly considered. The experimental group was comprised of students who were located in the township and had knowledge about and access to computers and internet, either at the OUT headquarters or at their respective centers. The control group, on the other hand, was mostly comprised of students from both the township and remote areas who lacked knowledge about and/or access to computers and internet. Students in the experimental group were oriented regarding how to use Moodle LMS during the course, after which they accessed courses for a period of 12 weeks through computers at the computer laboratory in their respective regional centers.

Participants

Instructors

Twelve instructors, eight from the FSTES and four from the ICE, participated in the study and delivered their courses to students at the regional centers through Moodle. The instructors from FSTES were selected because they were involved in teaching courses that were identified by the faculty to be converted into e-learning courses. The four instructors from ICE were selected based on their interest in participating in the study. All instructors were based in Dar es Salaam; their average age was 37 and 41, in FSTES and ICE respectively. Instructors had different teaching experience and all had excellent computer and internet skills.

Students

A total of 553 students drawn from the Dar es Salaam, Singida and Manyara regional centres participated in the study. Table 14.1 provides the background characteristics of students collected via the students' questionnaire. There were 337 students in the experimental group and 216 students in the control group.

Table 14.1 Student background characteristics

	Regional Centres		
Characteristics	Dar es Salaam	Singida	Manyara
Students with e-learning delivery (experimental group)	210	76	51
<i>Faculty/institute</i>			
<i>FSTES</i>	63	38	35
<i>ICE</i>	275	90	52
<i>Gender</i>			
<i>Male</i>	102	31	24
<i>Female</i>	107	45	28
<i>Computer experience</i>	1.5–2 years	4 months–1 year	4 months–1 year
<i>Computer skills</i>	Good	Good	Good
<i>Frequency of computer use</i>	At least 4–5 times per week	At least 2–3 times per week	At least 2–3 times per week
<i>Access to computer and internet</i>	At OUT library and internet cafe	At workplace, regional centre and internet cafe	At regional centre and internet cafe
Students with print-based delivery (control group) ^a	128	53	35

^aStudents in the control group did not complete the student questionnaire, and therefore did not provide information about background characteristics

Instruments and Data Analysis

The following instruments were used: *interview guide for instructors*, *course analysis guide*, *questionnaire for students*, and *university examination for students*. The interview guide for instructors was used to collect data on the impact of collaborative course design on instructors' instructional practices. Each instructor was interviewed at the end of course delivery. A total of 12 interviews were conducted, transcribed and transported into *Atlas.Ti*. Deductive and inductive coding was used to analyze the data. Clusters and sub-clusters were identified (Miles & Huberman, 1994). Samples of the interview responses of four instructors were re-coded by a colleague in the department using a provided list of codes. Inter-rater reliability was .84 (Cohen's κ) indicating good reliability.

Courses that were redesigned by instructors in the design teams were analyzed using a *course analysis guide* which was developed for the study. The guide sought to explore the kind of learning resources that each course contained. *Questionnaires* were administered to students in the experimental group at each regional centre at the end of the 12 weeks. The questionnaire explored students' experiences with the e-learning courses and delivery. Around the same time, University Examinations (UE) were administered to students (from both the experimental and the control

groups) to determine the impact of the e-learning courses and delivery on their academic outcomes. Data from questionnaires and UE were analysed and descriptive statistics (means, standard deviations and frequencies) were computed. In addition, *t*-tests and an ANOVA post-hoc test were used to calculate differences between regional centres and instructional approaches.

Results

Instructors' Preparedness for E-Learning Implementation

Results in Table 14.2 show that collaborative course design contributed to instructors' preparedness for e-learning implementation in four ways. Collaborative course design (i) promoted knowledge of *challenges* of print-based delivery for distance learning implementation; (ii) ensured *support*; (iii) allowed *collaboration*; and (iv) facilitated *encouragement* from colleagues.

All instructors (except T6 and T7 from FSTES and T11 from ICE) indicated that working in design teams made them discuss the challenges they encounter in print-based delivery. According to the instructors, such an opportunity contributed to their preparedness for using e-learning technologies, as indicated by T12:

I knew the challenges of delivering courses by study materials, but I never took time to think about them nor thought of using technologies. The professional development was so specific in stimulating discussions in the general meetings on the challenges that are caused by dependence on print-based teaching. It provided an opportunity to discuss the best way to address the challenges by technologies. This contributed to using Moodle in my teaching. (T12)

According to the instructors, despite few demonstrations, dialogues in the design teams helped them understand why they should consider using Moodle, e-mail and mobile phones in their teaching. The following statement by T4 is an example:

The workshops were useful despite few demonstrations on how to use Moodle. They (the workshops) opened up discussions about why e-learning technologies should complement

Table 14.2 Contribution of collaborative course design to instructors' preparedness

Ways	Faculty of Science, Technology and Environmental Studies (<i>n</i> = 8)								Institute of Continuing Education (<i>n</i> = 4)			
	DT 1		DT 2		DT 3		DT 4		DT 5		DT 6	
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Challenges/ reasons	x	x	x	x	x	o	o	x	x	x	o	x
Support	x	x	o	o	x	x	o	o	x	x	x	x
Collaboration	x	x	o	x	x	x	x	o	o	x	x	x
Encouragement	x	x	x	x	x	x	x	x	x	o	x	o

x = Did contribute in this way, o = Did not contribute in this way

DT design team, T Teacher/Instructor

print delivery of course. The professional development made me aware of the reasons for using e-learning technologies in the teaching process, which contributed to my using of Moodle and e-mail to deliver courses. (T4)

It is evident from Table 14.2 that the support offered to the instructors also helped instructors feel prepared to implement e-learning. There were two perspectives expressed about support. In the first perspective, instructors (particularly those in FSTES) indicated *“support by the faculty and the university management contributed to the implementation of Moodle in course delivery”* (T7). In the second perspective, all instructors in ICE and half of the instructors in FSTES indicated that the pedagogical and technical support offered by the support staff and colleagues also promoted their confidence, which contributed to e-learning implementation in their teaching. A comment from T12 expressed the experiences of the majority of instructors:

I found the supportive environment in the design team as a contributing factor to successful implementation of e-learning technologies in my teaching. The pedagogical and technical support offered during the professional development ensured sufficient experience in integrating technologies in the delivery of courses. I enjoyed working with colleagues and supporting each other; this made us competent in using Moodle, e-mail and mobile phones for course delivery. (T12)

Furthermore, the results in Table 14.2 show that three-quarters of the instructors (except for T3 and T8 from FSTES and T9 from ICE) indicated that *collaboration* in design teams contributed to their preparedness to use e-learning technologies in teaching. According to one of the instructors, *“collaboration allowed sharing and exchange of ideas and experiences about course delivery (by Moodle) and support of students (by e-mail and mobile phones), which promoted confidence and preparedness to use such technologies”* (T4).

The majority of the instructors (except for T10 and T12) also felt that *encouragement* contributed to e-learning implementation, and here again there were two perspectives. In the first perspective, instructors indicated that *“encouragement by colleagues in the design teams and general meetings motivated them to transform their courses for delivery using e-learning technologies”* (T9). In the second perspective, the majority of the instructors from FSTES (exemplified by T5) expressed that *“encouragement by colleagues in the faculty and the board members who were very supportive of the e-learning implementation idea, contributed to the use of Moodle in the faculty”* (T5).

Instructional Practice of Instructors

All instructors found using Moodle LMS to deliver courses and resources to students to be interesting. The following statement by one of the instructors expressed the experience of the majority of the instructors: *“Developing the courses was a bit challenging but I enjoyed using Moodle to deliver my course. I found using it*

Table 14.3 Learning resources offered by courses in Moodle LMS

Resources and materials	Faculty of Science & Environmental Studies (<i>n</i> = 8)								Institute of Continuing Education (<i>n</i> = 4)			
	DT 1		DT 2		DT 3		DT 4		DT 5		DT 6	
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
Course outline	o	x	x	x	x	x	x	x	x	x	x	x
Study material	o	o	x	x	x	o	x	x	o	x	x	x
Articles	x	x	x	x	o	x	o	o	x	x	x	o
Lesson notes	x	x	x	x	x	x	x	x	x	x	x	x
Lesson activity	o	o	o	o	o	x	o	x	x	o	o	o
PowerPoint slides	x	x	x	x	x	x	x	x	o	x	x	x

x = material/resource was offered, o = material/resource was not offered

DT design team, T Teacher/Instructor, C Course

[Moodle] interesting and useful particularly because it allowed delivery of learning materials and articles to students during the course” (T10).

Analysis of the redesigned courses in Moodle LMS revealed that there was diversity in terms of how many learning resources were contained in each course (Table 14.3). Note that most of the courses included course outlines (all but one), study materials, lesson notes, PowerPoint slides (all but one), and review questions (all but one).

Furthermore, results from the interviews indicated that instructors used e-mail and mobile phones (mostly text messages) to interact with students during the course more than before. None of the instructors reported having used postal services during the course. The statement by one of the instructors (T6) is an example:

Unlike before, I communicate with students regularly through mails and sometimes text messages. I have to check my e-mails regularly than before to make sure that I don't miss replying student's e-mails on time. Previously I used e-mail only for communicating with friends and relatives but now I can use it to communicate with students.

The majority of the instructors expressed that they used e-mail mostly for providing (i) course outlines, (ii) learning resources such as study materials and articles, and (iii) feedback to students.

Students' Experience with E-Learning Courses

Table 14.4 shows that students at all three regional centres studied were positive about the courses because they found the *courses clear* and that e-learning made interaction and communication with instructors more *flexible*.

Table 14.4 Students' experience with courses and e-learning delivery

E-learning characteristics	Regional centres		
	Dar es Salaam (<i>n</i> = 210)	Singida (<i>n</i> = 76)	Manyara (<i>n</i> = 51)
	Mean (SD)	Mean (SD)	Mean (SD)
Course clarity	4.4 (.60)	4.3 (.60)	4.3 (.56)
Flexibility	4.4 (.58)	4.3 (.48)	4.3 (.51)

Scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree

Table 14.5 Ways that e-learning technology addressed challenges of print-based delivery

Ways	Regional centres		
	Dar es Salaam (<i>n</i> = 210)	Singida (<i>n</i> = 76)	Manyara (<i>n</i> = 51)
	Mean (SD)	Mean (SD)	Mean (SD)
Learning support	3.9 (.61)	3.8 (.58)	3.7 (.58)
Delivery	4.2 (.71)	4.0 (.79)	4.3 (.54)
Limitations	2.7 (1.1)	2.5 (1.0)	2.3 (.98)

Scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Table 14.5 shows that students across regional centres reported that e-learning technologies improved *learning support*. E-learning technologies enhanced course *delivery*. In particular, with e-learning, students were able to get sufficient and up-to-date learning resources during the course and there was timely delivery of course outlines. The students' major concern was the fact that the offline Moodle system was *limited* in location and time. No significant difference in *learning support*, *delivery* and *limitations* were found between regional centres.

A large proportion of students at all three regional centres indicated that it was easier to access courses and resources with e-learning than with print-based delivery (Table 14.6).

Students' Academic Outcomes

The impact of e-learning implementation on students' academic outcomes is presented in Table 14.7.

The results show that e-learning implementation had a statistically significant positive impact on the academic outcomes of students in all courses but 3, as indicated by the respective *p* values for the *t*-tests conducted. The magnitude of the impact of e-learning implementation on academic outcomes was between medium and large (effect size values between .3 and .6).

Table 14.6 Comparing access to resources between e-learning and print-based delivery

Resources	Perceived ease of access to learning resources (in %)					
	Easier in e-learning delivery			Easier in print delivery		
	DSM (n = 210)	SGD (n = 76)	MNY (n = 51)	DSM (n = 210)	SGD (n = 76)	MNY (n = 51)
Course outlines	64.3	75.0	80.4	29.0	18.4	15.7
Articles	85.2	90.8	92.2	6.7	6.6	5.9
Lecture notes	86.2	89.5	92.2	4.8	3.9	3.9
Study materials (soft copies)	83.3	77.6	80.4	5.7	9.2	9.8

DSM Dar es Salaam, SGD Singida, MNY Manyara

Table 14.7 Students' academic outcomes in e-learning and traditional print-based delivery

Courses	E-learning (n = 337)	Print (n = 216)	Effect size
	Mean (SD)	Mean (SD)	(Cohen's d)
Introduction to probability and statistics	49 (23)	48 (11)	.06
Communication skills for IT*	54 (15)	48 (11)	.46
Computer ethics and cultural implications**	56 (13)	51 (9)	.45
Information systems planning and management**	56 (12)	49 (13)	.56
Introduction to computer security*	55 (14)	50 (9)	.42
Introduction to microcomputer applications I**	52 (13)	45 (11)	.58
Introduction to numerical methods	53(12)	54 (7)	-.10
Network design and administration**	55 (11)	50 (11)	.45
Physics**	55 (13)	50 (11)	.42
Development studies	54 (12)	53 (12)	.08
Communication skills**	52 (12)	49 (11)	.26
Geography**	55 (13)	51 (12)	.32

* $p < .05$; ** $p < .01$

Discussion and Conclusions

The study reported in this chapter investigated the impact of *Collaborative Course Design* on instructors' instructional practice and students' academic outcomes at the Open University of Tanzania. The results showed that *Collaborative Course Design* had a positive impact on instructors' instructional practice. Consistent with other studies (e.g., Voogt, 2010; Voogt, Almekinders, Van den Akker, & Moonen, 2005), *Collaborative Course Design* was effective in preparing instructors to use Moodle LMS (supported by e-mail and mobile phone) to deliver courses. As a result of

Collaborative Course Design, instructors developed positive perceptions regarding the use of both e-mail and mobile phones. According to the instructors, e-mail was useful for sending course outlines, additional learning resources (e.g., articles), and feedback to students (cf. Dabbagh & Kitsantas, 2005).

It was also established during the study that *Collaborative Course Design* provided an opportunity for instructors to discuss challenges of their traditional instructional practice, as well as the rationale for and the potential of e-learning technologies. This was possible because instructors acknowledged that expertise is shared and that good ideas about how to organize e-learning courses emerged through conversations and collaborations at both the design and implementation phases of course delivery (cf. Stewart, Cohn, & Whithaus, 2016). As found by Simmie (2007), the support offered to instructors during course design and delivery, as well as collaboration and encouragement by colleagues, were critical and contributed to the effectiveness of *Collaborative Course Design*.

After experiencing e-learning for the first time, the students had a positive experience with e-learning delivery. They found courses to be clear in terms of content, structural layout and organization. Interactions with instructors by e-mail and mobile phone communications were flexible, and none of students used postal services during the course. Unlike in traditional print-based delivery, students in e-learning delivery used communication technologies to interact with instructors during the course for different learning needs. Students typically used the technologies they found most convenient: Whereas e-mail seemed convenient for students in Dar es Salaam, those in Singida and Manyara preferred mobile phones (usually short text messages). Access to communication technologies may have influenced students' decision on what technology to use. According to Malikowski and Theis (2006), increased interactions lead to increased satisfaction and retention of students in distance education.

Regarding student learning, the results revealed that, consistent with other studies (Bates, 2000), e-learning delivery had a positive impact on students' academic outcomes in all (but three) courses, with a medium effect size, in general. According to Cohen (1988), it is worthwhile investing resources in educational innovations with a medium effect size. The success in student learning is associated with the fact that the e-learning technologies addressed the challenges of print-based delivery, in particular by improving the delivery of courses and access to course outlines, soft copies of study materials and articles. E-learning also enhanced the provision of learning support to students through e-mails and mobile phone. Similar results have been reported in other studies (Bates, 2000; Dunn, 2004; Papastergious, 2006). According to Summers et al. (2005), reasons such as the motivation of students, the nature of lesson activities, student characteristics and instructor characteristics also made students benefit more from an e-learning environment. The major concern of students pertained to the location and time limitations of offline Moodle, since it required them to visit the centre to access courses and resources.

It is recommended that the university should consider investing resources towards up-scaling of e-learning implementation for course delivery across faculties and institutes. In this case, *Collaborative Course Design* can be used to prepare instructors for

e-learning course design, delivery and implementation. Together with this, efforts should be made to understand the available opportunities and challenges that can support or hinder large-scale e-learning implementation at the Open University of Tanzania.

The promising results related to *Collaborative Course Design* as a strategy for e-learning implementation offer possibilities for other academic institutions to systematically implement e-learning to enhance programme delivery through distance education in sub-Saharan Africa. Numerous studies have already been reported that can be considered as offering exemplary practices on how to organize *Collaborative Course Design* as a strategy for instructors' preparation in the context of sub-Saharan Africa (Kafyulilo, Fisser, & Voogt, 2016; Stewart et al., 2016).

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