



## **MAINSTREAMING ICT MOBILE IN TEACHING LARGE CLASSES IN HIGHER LEARNING INSTITUTIONS IN TANZANIA: THE CASE OF ARDHI UNIVERSITY**

**Sophia R. Lukwale<sup>1</sup>**

<sup>1</sup>Directorate of Library Services, Ardhi University, Dar-es-Salaam, Tanzania

### **ABSTRACT**

*Mobile learning is part of a new learning landscape created by the availability of technologies supporting flexible, accessible, personalized education. With the increasing demand of over enrolment of students in higher learning institutions (HLI) around the world teaching of large classes has become an issue that requires close attention. This study was conducted to generate evidence for proposing solutions on how to mainstream mobile ICT technology and facilities in teaching and learning in expanding large classes in the higher learning institutions in Tanzania. A structured self-administered questionnaire was used to collect data. Random sampling was used for the selection of respondents. Study population consisted of 120 first to fifth year students. Generally, the findings of the study showed that most students (90.7%) are capable of using ICT facilities, 90% of the students agreed that the ICT facilities in the university need to be updated to suffice the demand posed by large classes as well as catch up with the increasing pace of Information and Communication Technology. The majority 96.9% use internet for studying purposes. Moreover, a small number of respondents 14% pointed out that the ICT facilities used are excellent. Furthermore, the results highlighted the challenges faced by students when taught in large classes. Based on the findings the HLI management can improve upon usage of mobile ICT technology in teaching large classes by increasing the ICT budget, setting clear rules to ensure students are taught using ICT facilities and include laptop/computer as a mandatory faculty requirement to students.*

**Keywords:** Literacy, Schooling, Teacher, ICT, Tanzania, M-learning, University, Large classes, Higher learning.

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### **Contribution/ Originality**

This study contributes in the existing literature on teaching large classes through mobile ICT in Tanzania where, little empirical evidence on the use of information technology exists. Additionally, it sought to find an innovative way to mainstream ICT as a solution to address the problem of teaching large classes.

### **1. INTRODUCTION**

Information and Communication Technology (ICT) Mobile learning is emerging as a promising market for the education industry (Zarei and Safdari, 2012). According to UNESCO (2010) initial researches have shown that Mobile learning is part of a new learning landscape created by the availability of technologies supporting flexible, accessible, and personalized education. This is a relatively unexplored area and there is much more that can be done with mobile technologies.

Mobile learning as defined in the WP 4 – Guidelines for Learning/Teaching/Tutoring in a Mobile Environment is “Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies” (O'Malley *et al.*, 2003).

Mobile devices are portable and light in weight and usually small, sometimes fit enough to carry on one's palm or pocket. A good example of these devices can be smartphones, palmtops, handheld computers, tablet PCs, laptop computers and personal media players. With the help of such devices teaching and learning can be done more easily compared to other tools used especially in managing large classes.

Another distinctive feature of mobile learning is that it enables learners to enter an information network at the precise moment when necessary by using a portable learning device and a wireless network.

According to Quinn (2000) 'Mobile learning is learning through mobile computational devices'. Shepherd (2001) reports that 'M-learning is not just electronic it's mobile'. Mobile learning brings unprecedented opportunities for both education institutions and governments as well (Quinn, 2000). In the context of education institutions, many higher education managers have seen mobile learning as a way of extending the reach and hence increasing revenues (Murphy, 2006). Zarei and Safdari (2012) also noted that, when there is an interaction of the learning material, technological platform and the wireless network mobile learning is crucial. In this case, m-learning relies on pedagogical theories and strategies of the Behaviorist, the Cognitive, and the Constructivist Learning groups. As detailed in Martinovic *et al.* (2010) the recent technological advances particularly in internet and mobile phones have made redefining learning concept and framework necessary in order to recognize the role of mobility and communication in the learning process and deformation in the digital networks to protect virtual social networks and removing their obstacles. M-mobile is becoming an important technological innovation that can address the high demand in the development of higher learning in the developing countries.

Little empirical evidences on how mobile ICT are used in learning among students in universities especially in large classes in the developing countries have been developed. Such studies are carried out by Nakabugo *et al.* (2008) discussing the challenges of teaching large classes and ICT as a solution to ease teaching and learning process. Zarei and Safdari (2012) also discussed mobile learning as an important factor in the interaction process. Goh and Kinshuk (2006) and Muyinda (2007) have also confirmed that a number of issues concerning m-learning have not yet been covered. With these few mentioned studies there is still a need to conduct more researches on the issue concerning the use of mobile ICT in the education systems. The results of the carried out researches will contribute to the improvement and in other cases inclusion of the mobile learning as one of the methods of teaching in higher learning institutions especially in the countries such as Tanzania which is actively increasing enrolment in its higher learning institutions.

Today, large classes are common entities in various universities. This is due to different reasons. Many countries want their people to have higher education and Tanzania is no exception. With this concept in mind higher learning institutions in Tanzania have been tasked to increase enrolment, hence, eruption of large classes. In the National Higher Education policy (NHE) of Tanzania, one of the tasks was to increase the number of enrolment of students in order to attain international comparable student-staff ratio in various disciplines. One of the strategies to meet this objective was to increase enrolment of students in public institutions (MSTHE, 1999). Furthermore, the rise of private institutions by the end of 1995 has also contributed to the increase of students' enrolment. Privatization of the higher education scheme was introduced by the government due to fiscal incapacity of the state to expand higher education through public universities and inability of the public universities to respond immediately to household demand for employment oriented courses. Private higher education in Tanzania, in general provides a crucial service to the nation as the country struggles to increase access to higher education (Kapinga and Bie, 2010). Given the large scale of expansion of Tanzanian private higher education, 35,821 total numbers of students were enrolled at public universities by 2006 (Msolla, 2006). The total enrolment today is even

higher given that new universities and university colleges; both public and private have been established. At the same time, universities are under increasing pressure to do more in terms of producing a competent human resource for the job market with less technology to assist in the development process so there is a need to use economical and efficient delivery processes in the delivery of courses and units. Whilst, large classes are very common in universities, there are many problems and issues that arise as a consequence (McInnis and Devlin, 2002; Stanley and Porter, 2002). Such problems may include not being able to produce a competent human resource for the market demand for different fields of knowledge.

Learning as well as teaching in a large class can be a difficult experience not only for learners but teachers inclusive. Large classes can pose problems for learners that include difficulties such as lack of individual attention, learning activities that lack interactivity and engagement, problems with access to learning resources and difficulties with learning support and assistance (Chalmers, 2003). In large classes, teachers are often constrained by the need to design and deliver a course that seeks to serve the need and interests of a diverse range of learners. The delivery of a structured programme of learning across such a large number of students with individual needs can create difficulties for many learners (Carbone, 1998).

As indicated in Ives (2000) there is no single way to teach a large class but three things should be taken into account in order to determine how such classes could be taught. These include the teaching style, characteristics of students and the goals and objectives of the course that is being taught. For practical oriented courses, the size of the class determines the quality of delivering of the course. Having large classes, could need more lecturers to teach such a class. One professor could lead in teaching and a number of teaching assistants to assist in giving out the tutorials to ensure that the students are well equipped with the practical skills. However, Professors assisted by teaching assistants alone may not be the one and only best solution in teaching large classes, but the inclusion of ICT using mobile devices can bring a great change. Moreover, many projects have reported the success of mobile devices being used to support teaching and learning across all sectors of education (Hill *et al.*, 2003; Kennedy, 2003). Most of these successes include increase of knowledge and competency among students. In a number of researches it has been noted that mobile laptops have enhanced student-centred learning in form of a platform for support and access to rich information and content base (Hill *et al.*, 2003). According to AUTC (2003) cited in Nakabugo *et al.* (2008) resource allocation is becoming more critical in dealing effectively with large classes than small classes. As further indicated in Nakabugo *et al.* (2008) teaching large classes have several challenges that teachers and students face. Teaching using traditional means can only be fruitful if the class is of an optimal size of less than a hundred students and not otherwise. Institutions are expected to maintain a staff-student: ratio that makes it viable and sustainable. Table 1 shows the summary of staff, student ratio for Tanzania higher learning institutions as reported by the Tanzania Commission for Universities (TCU) regulatory body for higher education (Tanzania Commission for Universities, 2012). Furthermore, Ardhi University (ARU) apart from TCU ratios is guided by its staff-student ratio which is not very much different from that of TCU. The ratio at ARU for the past five years has been different, ranging from 1:9 in 2009 to 1:16 in 2013. Ideally ARU staff-student ratio appears to be in accordance with TCU requirement, however there are particular subjects taught at the university which involve more than hundred students in a class. These subjects include Research methodology, Communication skills, Building technology, Mathematics, Development studies etc.

Table-1. Tanzania University Staff-Student ratio

S/n	Item	Staff-student ratio			
		Ideal	Good	Acceptable	Un Acceptable
1	Arts, social sciences and humanities	1:18	1:35	1:40	> 1: 40
2	Science and Technology	1:10	1:15	1:20	> 1:20
3	Engineering	1:8	1:15	1:25	> 1:25

Source: TCU (2012)

With the ratios above, Ardhi University has to find other means to meet the staff-student ratio as advised by TCU especially in those subjects which cut across almost all the programmes at the university. Therefore, the need of ARU supplementing the teaching of large classes with the help of ICT cannot be underscored. In this case, the researcher saw the necessity to conduct this research so as to document what is happening at ARU as well as some experiences of other universities and advice conducive methods applicable to ARU in relation to teaching large classes. As indicated in Nakabugo *et al.* (2008) challenges in teaching large classes include, among others minimum teaching attention to students and teaching styles. Other challenges may include the use and quality of teaching facilities. In most of the Tanzanian Higher Learning Institutions, with Ardhi University as a case study, inclusion and the use of ICT technology can be one of the major solutions to existing problems of teaching large classes. Technology is often proposed as a potential solution for catering with individual differences in educational settings particularly in instances where large classes are involved (Laurillard, 1993). As a developing and on-going research area, numerous issues concerning m-learning have not yet been fully covered (Goh and Kinshuk, 2006; Muyinda, 2007). The research was conducted to justify the need to mainstream mobile ICT technology and facilities in teaching and learning in the expanding large classes in Tanzania. Therefore, Ardhi University was selected as a case study among the universities that have embarked in adding enrollment of students in its programmes which has resulted into large classes in some of its courses and subjects.

## 2. METHODOLOGY

The study was carried out at Ardhi University located in Dar-es-Salaam, Tanzania. Structured questionnaire with a variety of closed and open ended questions was used. A group of respondents representing ARU students' community who attended large classes were sampled. The group included undergraduate students of six different schools from first to fifth year. The six schools included School of Construction Economics and Management (SCEM), School of Environmental Science and Technology (SEST), School of Architecture and Design (SADE), School of Real Estate Studies (SRES), School of Urban and Regional Planning (SURP) and School of Geospatial Sciences and Technology (SGST). A total of 120 questionnaires were distributed to students and 114 (95%) were returned, of which 48 came from females respondents.

Data collected from the field on matters related to the type of ICT facilities, different uses, possibilities of using these facilities in teaching and learning were analyzed using version 16.0 of Statistical Package for the Social Sciences (SPSS). Frequencies were used to generate the understanding of the application and use of the ICT facilities at ARU and Tanzania by students in general. Likert scale was used to rank some of the responses. Tables and figures were used to present the findings.

## 3. RESULTS AND DISCUSSION

In this section, respondents and their perceptions to ICT facilities and their uses is addressed. This section presents and discusses the respondents' perceptions to ICT facilities and their uses. The results present awareness and use of ICT facilities at ARU as well as the quality of ICT facilities at the University. Furthermore, the results highlight the challenges faced by students when taught in large classes using traditional methods and the possible remedial actions to address the challenges.

### 3.1. Nationality and Year of Study of the Interviewed Students

The results show that 99.5% of the respondents were Tanzanians and only 0.5%, were foreigners from Uganda. Regarding the years of study, the majority (59.6%) of the interviewed students was in their first year of study followed by 39.9% in second year and only 0.5% were in third, fourth and fifth years. The essence of having majority of respondents from the first and second years of study is due to the fact that most of the big classes are composed of subjects that are jointly taught in these classes. Table 2 presents schools where the interviewees are

registered. Of all the respondents, majority were from the SEST, followed by those of SRES, SURP, SGST, SADE and SCEM.

**Table-2.** Respondents and schools where they are registered

S/n	School	% of respondents
1	SEST	20.7
2	SRES	19.7
3	SURP	19.2
4	SGST	16.7
5	SADE	14.1
6	SCEM	9.6

### 3.2. Students ICT Facilities Use and Preferences

Findings from this study indicate that 90.7% respondents were able to operate computers as the main ICT facility and 88.7% indicated to use computer facilities. Also a total of 89.1% respondents indicated to be comfortable in using computers for their studying purposes. These results show that the learning process including teaching will ease due to the fact that a bigger number of students are not only able to operate a computer but are comfortable to use it as well.

In teaching these classes the use of ICT facilities has been sought as the way of reducing the challenges that face teaching of large classes. In the case of ARU challenges of teaching large classes include students not being able to follow up the lectures, poor listening, less interaction with the lecturer, as well as not being able to see clearly on the black/white boards among others. There is usually little opportunity for interactions because with so many students, only a very small number might ever be able to interact. The physical size of many lecture theatres often means that even if students were able to interact, they could not be heard or seen by the teacher or others in the class. With mobile technologies using wireless communications channels and receivers, the capacity to communicate and interact is greatly enhanced. The use of ICT as a solution to ease teaching and learning process has also been noted in [Nakabugo et al. \(2008\)](#). In teaching big classes a potential solution for catering individual differences in educational settings where large classes are involved is by inclusion and the usage of ICT Technology ([Laurillard, 1993](#)). Table 3 gauges respondents' operational ability, purpose for which computer is used and how comfortable one is in using a computer.

**Table-3.** Students' awareness and use of computer for studying purposes

S/n	Questions on Computer use and Awareness	% respondents	
		Yes	No
1	Able to operate computer?	90.7	9.3
2	Using computer for studying purposes?	88.7	11.3
3	Comfortable in using computer?	89.1	10.9

In regard to the question as to whether students had attended any computer courses, it was noted that 20.8% had certificate in ICT, 18.6% attended a computer course with no certificate, 3.8% acquired diploma in ICT and the majority (56.8%) have no ICT training especially in computer. However, compared to the results in Table 4 the researcher noted that the majority of the students operate computers without any formal education. Table 4 presents ARU student's ICT training levels.

Table-4. ARU Student's ICT training levels

S/n	Level of computer knowledge	% of respondents
1	Awarded certificate	20.8
2	Attended computer course with no Certificate	18.6
3	Diploma in ICT	3.8
4	No ICT training	56.8

### 3.3. Main Uses of ICT Facility by ARU Students

ICT facilities that are used by students at ARU include computer and mobile telephones. Respondents were asked to indicate as to what extent they use ICT facilities in their academic endeavour by being allowed to choose more than one answer. The main uses of the ICT facilities presented in Figure 1 include assignments (76.5%), learning tools through literature search (67.5%), and communication purposes (57.2). Others included data storage (41.4%), entertainment (41.4%), presentation (34.3%), data entry (28%), drawings and design purposes (17.2%), teaching tool (14.1%), and dissertations (12.7%). These results show that ICT facilities are used more in doing assignments (76.5%) followed by learning tools through literature search (67.5%), as well as communication purposes (57.2). However, it is noted that many respondents did not see the importance of computers in data storage, data entry, presentation, design purposes and worse still writing of dissertations. These areas received less than 50% response.

Despite the high ability of respondents in operating and using the computers, it is anticipated that most of them should be using computers for dissertation writing. Dissertation is mandatory for all final year students, but in this case only 12.7% of the respondents indicated that they use computers for dissertation writing. This situation may have resulted due to either the respondents who answered this question were in their final year or final year students hire other people to write dissertations on their behalf. However, hiring of dissertation writers maybe be refuted as according to the [World Bank \(2013\)](#) Tanzania is categorized as *low-income* country, so this suggests that hiring of dissertation writers is not among the most common practices for students. The use of computer results reveals that the 12.7% respondents were in their final year while the rest were in their continuing years of their studies. Therefore, the respondents effectively use ICT facilities for their academic activities.

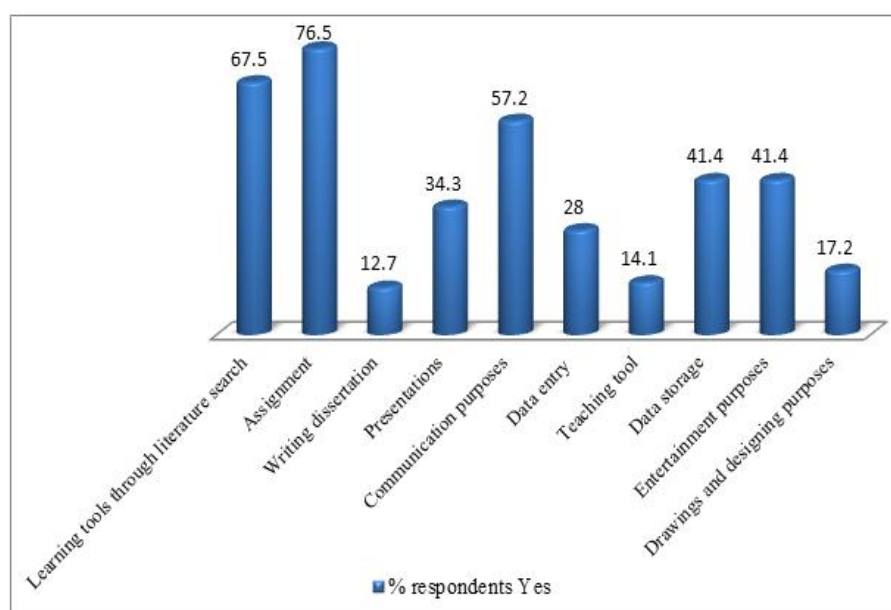


Figure-1. Main uses of computer by students at ARU

### 3.4. The Use of ICT Mobile Facilities as a Learning Tool for Teaching Large Classes at ARU

The ICT facilities used by lecturers to teach big classes as mentioned by the respondents included laptops, beamers and projectors. Quality of the facilities used for teaching was also evaluated by asking students on their perceptions. Results as shown in Figure 2 indicate that most of the facilities used are of good quality. However, respondents proposed the need to have fixed beamers in every class as it is becoming very difficult for the lecturers some of whom do not have their own beamers to teach a big class. Likewise, teaching using power point in some of the classes by some lecturers is restricted by the unavailability of beamers.

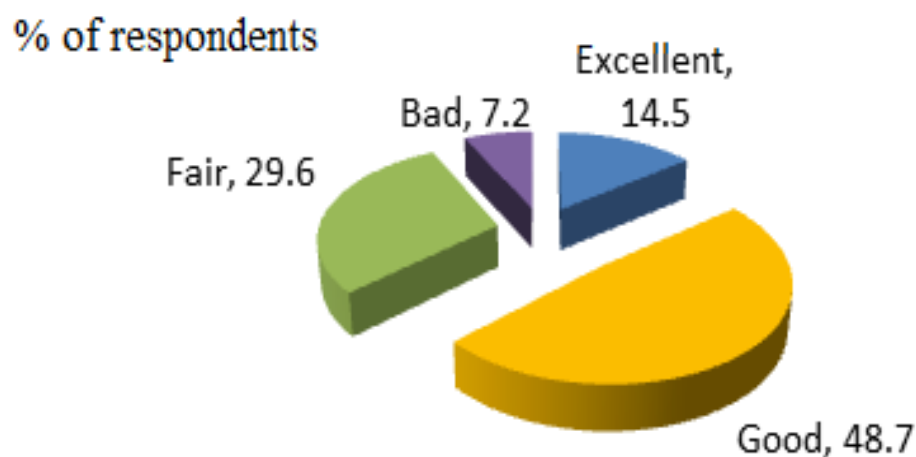


Figure-2. Quality of ICT teaching facilities at ARU

### 3.5. Students' Perceptions on the Use of ICT Facilities

Students' opinions on the use of different ICT facilities in teaching large classes were also determined. Majority of the respondents mentioned Power Point to be a useful tool for teaching large classes followed by the use of the black/green board and the last method indicated was the use of traditional lecturing of narrating. The results in Table 4 show that students are in favour of ICT in teaching large classes rather than traditional methods such as narrating which picked a small percentage of 16.0. This has also been noted by other authors as a solution for teaching large classes (Laurillard, 1993; Nakabugo *et al.*, 2008). Table 5 indicates the responses of the students regarding suitability of different teaching methods for the large classes in the University.

Table-5. Suitability of different teaching methods for large classes

S/n	Method	% respondents	
		Yes	No
1	PowerPoint	77.1	22.9
2	Green/black boards	50.0	50.0
3	Narrating	16.0	84.0

### 3.6. Mobile Phones

The respondents indicated mobile phones to be the other main ICT mobile facility that is used for studying purposes. Some of the academic uses included downloading study materials, discussing with other fellow students on different lectures and assignments, asking for clarifications on the lectures conducted and they also mentioned to receive assignment questions from their lecturers and class representatives. Table 6 shows the use of mobile phones in the academic purposes by students attending large classes.

Table-6. Students' academic purpose mobile phone use

S/n	Type of uses	% respondents	
		Yes	No
1	Downloading studying materials	70.9	29.1
2	Discussing assignments	41.0	59.0
3	Asking for clarifications from some lectures	38.5	61.5
4	Receiving assignment questions	26.5	73.5

### 3.7. Internet

Majority of the respondents (96.9%), indicated to use internet for studying purposes. Some indicated to have no access, nevertheless, they mentioned to benefit from others who can access and download materials for studies. The main uses of the internet as indicated by the students' representatives included among others source of reference materials and as a media to exchange academic information among students.

The sources of the internet facility have been indicated to be from various areas which include among others university library, wireless internet at various hotspots within the university, internet cafe, mobile phones and modems for the students who have their own laptops and desktop computers. In determining the internet access level of the students, the Likert scale was used. The accessibility was classified as excellent access (100-66.4% respondents), good access (66.3 – 33.4% respondents) and poor access (33.3 – 1% respondents) as shown in Table 7. The results show that the internet accessibility at ARU is good. However, at internet café's shows that internet accessibility is poor. Even though, most (4/5=80%) of the sources proved to be good the internet café source showed that the internet accessibility is poor. The internet cafes' that is internet business oriented portrays the real picture of the internet accessibility condition at the university in comparison to other sources. These results reveal that the internet accessibility at the university is not that effective as portrayed by most of the respondents.

Table-7. Internet Sources for ARU students

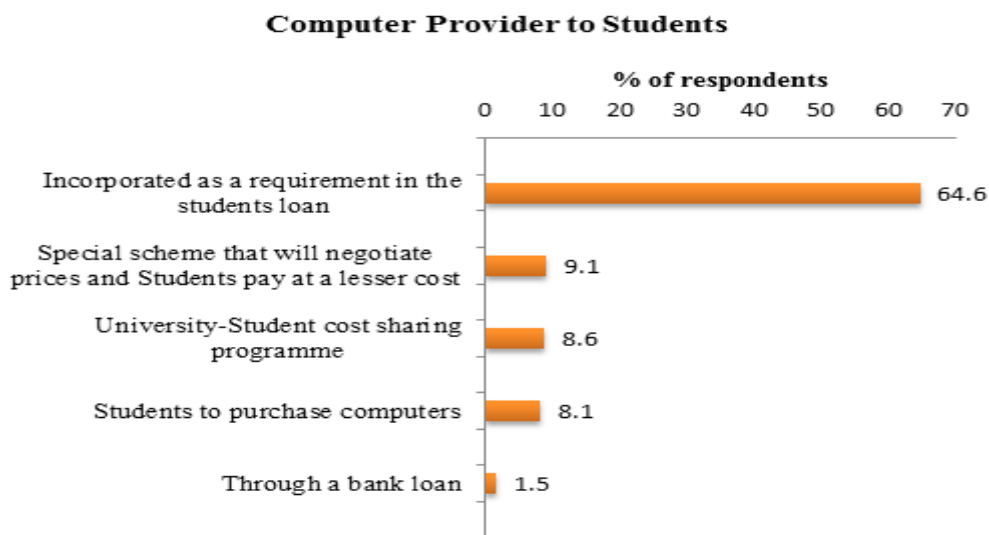
S/n	Source	% respondents		Remarks
		Yes	No	
1	University library	64.2		Good Access
2	Modems	41.1		Good Access
3	Mobile phones	36.3		Good Access
4	Wireless hotspots	34.7		Good Access
5	Internet cafes	24.7		Poor Access

### 3.8. Strategies to Mainstream Mobile ICT Facility as a Learning Tool in the Continuing Growing Enrolments at the Universities

In this study, respondents before proposing the strategies on how to mainstream ICT in teaching large classes they were asked as to whether the present facilities are sufficient and of up-to-date. The majority 90% were of the view that there is a great need to facelift the ICT facilities as well as the access. Furthermore, several options have been proposed in order to ensure that teaching large classes is enhanced at ARU and in the Tanzanian universities at large. The options included giving priority to the universities ICT facilities such as inclusion of the fixed PowerPoint beamers in each of the classes that has many students, setting a clear rule that each lecturer who teaches a large class should use ICT facilities and also the need to include laptop/computer as a mandatory faculty requirement.

Regarding the question on who should buy or provide the computer/laptop for students, majority (64.6%) of the respondents indicated that the computer/laptop should be included as part of education loan being given by the government to students, very few of them (1.5%) proposed to be given a bank loan. Figure 3 presents the results which indicate that respondents were not in favour of other proposals apart from the students' government loan.





**Figure-3.** Options for availing computer to university students as part of enhancing teaching to large classes

This may be because the loan given by the government to students is later on deducted from ones salary only when he/she is employed, moreover the loan is deducted over a long period of time with very minimal interest. Figure 3 presents the results.

#### 4. CONCLUSION AND RECOMMENDATIONS

The main ICT facilities that are in use in the case study university include computer and mobile telephones. Most of the students have indicated to use ICT mobile facility in various studying purposes such as literature search, communication purposes, and data storage, writing their assignments and dissertations as well as designing and drawing purposes. As enrolment is on the increase and that the immediate solution will not be class size reduction, mainstreaming mobile ICT in teaching could help in alleviating the challenges faced in teaching the large classes in the universities.

Based on the findings from this study, in order to mainstream mobile ICT in teaching large classes several strategic issues should be taken into account. The recommended strategies that are based on the findings include (i) increasing the budgets to ICT departments which will ensure that ICT facilities is improved at the University level, (ii) setting clear rules demanding lecturers who teach large classes to ensure that they teach using ICT facilities for the majority of students in these large classes to be able to access the knowledge easily, (iii) inclusion of a laptop/computer as a mandatory faculty requirement to enable all students to have computers that will help them be able to access information easily and comfortably. However, this can easily be accommodated if the students will be given access to a loan for computer. As indicated in Figure 3. most of the respondents were of the opinion that a loan from the government can enable students own a computer/laptop as a studying tool. The inclusion of a laptop computer as a mandatory faculty requirement could be done though the budget increase from the government to the education loans that students receive from the government. However, it is also possible to look critically at the possibility of students cost sharing programme or through a scheme that will ensure that students can access and purchase a computer at a lesser and affordable price. This can be reached through a special agreement between the provider and the student organizations and/or university management, (iv) creating and or strengthening ICT laboratories as well as providing computerized libraries can be the most appropriate and sustainable way to help in this situation. Among others be able to retrieve the literature that could be posted by the instructors to the university website and else where in different domains.

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