

ICT-Integration in Higher Education and Student Behavioral Change: Observations at University of Arusha, Tanzania

Makewa L. N.^{1,*}, Kuboja J. M.², Yango M.², Ngussa B. M.²

¹University of Eastern Africa, Baraton- Kenya, P. O. Box 2500, Eldoret, Kenya

²University of Arusha, P. O. Box 7 Usa River, Tanzania

*Corresponding author: ndikul@gmail.com

Received September 23, 2014; Revised October 09, 2014; Accepted December 08, 2014

Abstract ICT-Based education is a system of instruction that involves combination of computers and communication technologies. ICT Integration is important in combating digital divide, bringing about digital opportunity and paradigm shift from teacher centered to student centered learning, whereby the teacher passes the information quicker and in a more understandable manner. This study aimed at evaluating ICT-Based Education and Students Behavioral Change at University of Arusha, Tanzania. Questionnaire was the only means for data collection and Cronbach alfa of above .887 was established to signify that questionnaire items were highly reliable. T-test, ANOVA and Pearson product correlation coefficient tested three null hypotheses by the help of SPSS. The study established that University of Arusha educators are competent in the use of PowerPoint, Excel, Microsoft Word, online search procedures and internet programs and believe that ICT integration propels student centered approaches and increases the rate of learning. Educators, however, indicated lack of skills in online marking and data management procedures and limited integration of ICT resources in teaching learning transaction. Finally, the study established a positive and strong relationship between competence and application of ICT in teaching-learning transaction. This implies that the higher the competence, the likelihood of educators to integrate ICT in teaching-learning transaction.

Keywords: *ICT integration, instruction, higher education, behavioral change, university of Arusha*

Cite This Article: Makewa L. N., Kuboja J. M., Yango M, and Ngussa B. M, "ICT-Integration in Higher Education and Student Behavioral Change: Observations at University of Arusha, Tanzania." *American Journal of Educational Research*, vol. 2, no. 11A (2014): 30-38. doi: 10.12691/education-2-11A-5.

1. Introduction

The use of ICT-based interaction in improving students' behavioral change has long been debatable over the last decade. Several studies have tried to explain the role and the added value of these technologies in classrooms and on student's performances (Kulik, 1999; Sosin *et al.*, 2004; Fuchs and Woessman, 2004; Coates *et al.*, 2004) while on the other hand, some studies demonstrate that there is no evidence of a key role for ICT in higher education (Kirkpatrick and Cuban, 1998; Angrist and Lavy, 2002; Banerjee *et al.*, 2004; Goolsbee and Guryan, 2002). These debates increase curiosity in the minds of researchers to find out whether the debate is healthier in the educational paradigm and whether it's worth studying it.

Looking in short term parameters, it is difficult to conclude that the application of ICT in teaching and learning transaction commands students' performance in their everyday endeavors. Quite often, the standard approach focuses on achievement and curricula; how students understand the courses and obtain their degrees or

their marks. However, a more extensive definition deals with competencies, skills and attitudes learned through the education experience. The narrow definition allows the observation of the outcomes of any change in higher education, while the more extensive definition needs a more complex strategy of observation and a focus on the labour market. The outcomes of education are mainly validated in the labour market. The relationship between the use of ICT and student performance in higher education is not clear, and there are contradictory results in the literature. Earlier economic research has failed to provide a clear consensus concerning the effect on students' achievement and how ICT has impacted on the same. Our study however, focuses on competencies, skills, perception and behavior change attained from students if such application is exposed to students.

The integration of ICT in teaching and learning transaction has been supported by the engagement theory which presents a model for learning in technology-based environments while synthesizing many elements from past theories of learning. The major premise is that students must be engaged in their course work in order for effective learning to occur (Alavi 1994). The theory posits three primary means to accomplish engagement: (1) an

emphasis on collaborative efforts (2) project-based assignments, and (3) non-academic focus. It is suggested that these three methods result in learning that is creative, meaningful, and authentic.

Hiltz, 1994; Turrof et al., 1995) conducted a study related to online/virtual learning environments at the New Jersey Institute of Technology virtual classroom project that spanned many years, courses and instructors. The observable variables included online messaging, conferencing, online notebooks, online databases, online exams, and online grade-books. They concluded that the virtual classroom environment resulted in better mastery of course materials, greater student satisfaction, and a higher level of student-reported learning than traditional classroom experiences. What this study does not avail is whether the application of ICT in teaching and learning transaction has any direct implication on competence and how behavioral change is attained in students. It is this gap that this study attempts to fill.

1.1. Research Problem

No study has been conducted to evaluate the application of ICT in the teaching- learning transaction at University of Arusha. It is therefore, the intention of this research to fill this gap by evaluating ICT-Based Education and Students Behavioral Change as observation by University of Arusha Educators. The study investigates application of educational technology in teaching-learning transaction and student behavioral change as observed by university of Arusha educators. University of Arusha is a Seventh-day Adventist institution of higher learning in Tanzania that offers degree programs in business, education and theological studies. The study particularly investigates on educators' level of competence, application, perception and resultant student behavioral changes and will be guided by five research questions namely:

1. What is the competence level of university of Arusha educators in the use of ICT in teaching-learning transaction?
2. What is the attitude of University of Arusha educators on the place of ICT in students' behavioral change?
3. Is there significant difference in the application of ICT in teaching-learning transaction by University of Arusha educators categorized according to gender, school/faculty, education level and training?
4. Is there significant difference in the perception of usefulness of ICT in teaching-learning transaction by University of Arusha educators categorized according to gender, school/faculty, education level and training?
5. Is there significant relationship between competence and application of ICT in teaching-learning transaction?

2. Review of Related Literature

This review of literature focuses on engagement theory which advocates for ICT-based education which keeps learners involved in hands-on activities by the use of computer technology. This is supported by Motamedi and Sumrall (2000) in Tuckman and Monetti (2011, p. 502)

who contend that "the use of computer has contributed significantly to the recent success of the mastery learning/teaching approach." Tuckman (2000) in Tuckman and Monetti (2011) contend that "the use of computer-mediated class activities resulted in significantly better results than teaching the class in a traditional way. In talking about effect of computers on what people learn, Gagne et al (2005, p. 209) suggest that "many ideas and topics that have been left out of school curricular because of the limitation of traditional instructional media and delivery methods, such as blackboard, paper and pencils, and books, can now be introduced.

Particularly, this section concentrates on four variables namely; competence, application, perception and the place of ICT integration on student behavioral change.

Engagement theory has emerged from the authors' experiences of teaching in electronic and distance education environments (Shneiderman, 1998; Shneiderman et al, 1995 & Kearsley, 1997). The fundamental idea underlying engagement theory is that students must be meaningfully engaged in learning activities through interaction with others and worthwhile tasks. While in principle, such engagement could occur without the use of technology, it is believed that technology can facilitate engagement in ways which are otherwise difficult to achieve. So engagement theory is intended to be a conceptual framework for technology-based learning and teaching and hence, a guide of this study. Although not directly derived from other theoretical frameworks for learning, it has much in common with many such frameworks. For example, with its emphasis on meaningful learning, it is very consistent with constructivist approaches. Because it emphasizes collaboration among peers and a community of learners, it can be aligned with situated learning theories. Because it focuses on experiential and self-directed learning, it is similar in nature to theories of adult learning (Kearsley, 1997).

Integration of Information Communication Technology (ICT) in higher education is of paramount importance in combating digital divide which Gagne, Wager, Golas, and Keller (2005) define as the gap between those who have access to and those who do not have access to information technology. In addressing the issue of digital divide, Marshal and Taylor (2005, p. 2) indicated that "Unless we get a greater level of access and adoption of ICT for education... we will miss the opportunity to turn the "digital divide into a digital opportunity... particularly for those who risk being left behind and being further marginalized." ICT-Based education can be described as a system of instruction that involves combination of computers (Information Technology) and communication technologies. The term involves "everyday use of computers for the production of teaching materials ... used in a standard classroom situation to the transnational linking of learners around the planet for a shared learning experience that would have been quite impossible a generation ago" (Fallows and Bhanot, 2005, p. 1). Slavin (2009) contends that word processors, electronic spreadsheets, and presentation software are the most common electronic technologies that educators can use for instruction. Moore (2009, p. 208) holds that "computer use in the class can highly be motivational. Computers tend to increase student self confidence and determination.

Indeed when computers are integrated into the content areas, learners are more apt to learn.”

The coming of information and communication technology brings about a paradigm shift in the process of teaching and learning from teacher centered to student centered whereby the teacher passes the information quicker and in a more understandable manner (Ajoku, 2014). Yusufu, Kajuru and Musa (2014) support this when they say the potential powers of computer usage in the teaching/learning process have contributed to a change from traditional instructional methods to modern ways of teaching which emphasize on learner’s active participation. According to constructivism point of view, learners have to create their own knowledge under the guidance of the teacher; thus, the role of the teacher changes from teaching to facilitation.

As the world is speedily changing from analog to digital technology, mode of delivery in higher education system needs to change in order to adopt current trends. This is supported by Wilen-Daugenti and McKee (2008), who came up with the document of Cisco Internet Business Solutions Group (IBSG) regarding key trends for higher education in the 21st century, along with the role of technology in each. The document stipulates that adults of 18–26 ages are the first to adopt new technologies and bring these technologies onto higher education system, expecting their schools to have the infrastructure to support the latest technologies. “Because students spend much of their time online, university professors *should* see the value of posting academic materials on ... popular sites where students can download and interact with the course materials in a location where they also seek entertainment” (Ibid, p. 6). This background places ICT-based education at the top most importance in the contemporary society of teachers and learners in higher education.

The essence of ICT-based education in contemporary time is advocated by a number of writers and researchers. Larkin and Chabay (1992) regard ICT-based education as a system that provides an opportunity for online data reporting with which both teachers and students can follow individual progress. The study of Sharma, Gandhar and Sharma (2011) concludes that ICT-based education helps to keep students updated and enhances teachers capacity, creating a live contact between the teacher and the learner through internet, emails and e-learning. Joy and Ishikaku (2012, p. 68) argue that “teachers whose responsibility is to build the nation through their transfer of knowledge and skills acquired through education and training must be ICT competent.

It will be of no sense to talk about integration of ICT without looking at educators’ competence. ICT competence is one of important prerequisites for effective ICT integration in teaching-learning transaction. Gagne et al (2005, p. 2009) hold that “people need to be technologically literate in order to use electronic resources such as internet, search engines, internet development tools.” Even when Higher Education Institutions are well furnished with ICT resources, it will be of no benefit if educators do not have sufficient knowledge on how to integrate the resources. It should also be clear that, it is not enough for educators to have ICT skills and be able to use them in teaching their students. Instead, they need to be able to help the students become collaborative, problem-

solving and creative learners through ICT integration so that they will be prepared to be effective citizens and members of the society.

ICT competence helps teachers to develop their capacities in diverse approaches to teaching-learning process. The first is Technology Literacy which enables students to use ICT in order to learn more efficiently. The second is Knowledge Deepening, which enables students to acquire in-depth knowledge of their courses and apply it to complex, real-world problems. The third is Knowledge Creation, enabling students to create the new knowledge required for more harmonious, fulfilling and prosperous societies. Teacher competencies related to the knowledge deepening approach, for example, include the ability to manage information, structure problem tasks, and integrate open-ended software tools and subject-specific applications with student-centered teaching methods and collaborative projects in support of students’ in-depth understanding of key concepts and their application to complex, real-world problems. To support collaborative projects, teachers should use networked and web-based resources to help students collaborate, access information, and communicate with external experts to analyze and solve their selected problems. On the other hand, this helps teachers to be able to use ICT to create and monitor individual and group student project plans, as well as to access information and collaborate with other teachers to support their own professional learning.

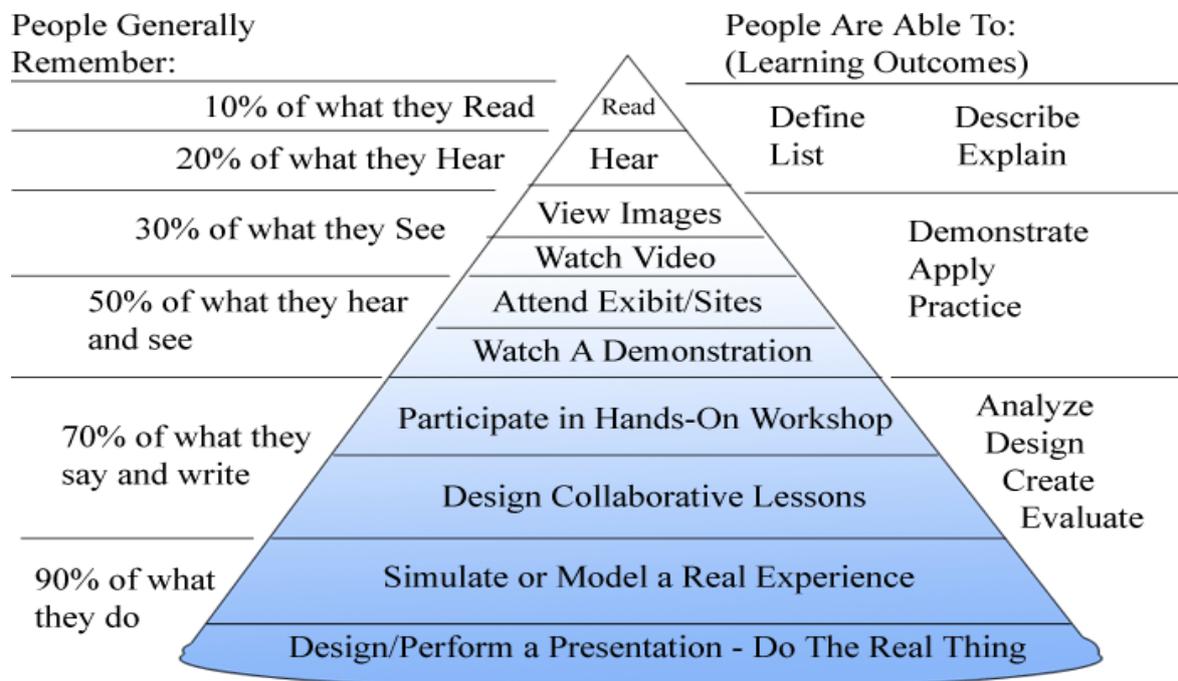
The essence for integration of ICT in teaching-learning transaction can be seen in the fact that “technology has become an integral part of students’ lives” (Tuckman and Monetti, 2011, p. 454) and that we are living in the age of evergreen students whom Wilen-Daugenti and McKee (2008) refer to as learners of early adult age (18-26), the first to adopt new and emerging technologies, bringing them into higher education settings. It is obvious that these students must expect their educational institutions to have appropriate infrastructure to support their technological longings which include social networking facilities such as blogs and wikis, online video, YouTube, iTunes, smart phones, and other related devices. This kind of situation requires educators in higher education to become digitally literate in order to meet the desires of the learners of the contemporary age. The study of Atsumbe, Raymond, Enoch and Duhu (2014) found out that lecturers and students in Federal University of Technology, Minna, had computers and laptops and can access the internet but, they do not use them for teaching and learning. This suggests that possession or availability of ICT resources is one thing while utilization of the resources is another.

Perception of ICT usefulness in teaching-learning transaction is multi-dimensional in nature because it can be affected by a number of factors. According to Alassaf (2014), while positive perception does not necessarily mean high level of integration, the following factors can affect educators’ perception: users’ experiences, lack of resources, lack of professional training, the faculty, gender, academic qualification, age, lack of institutional support, and lack of time.

Educators’ perception on usefulness of ICT in teaching-learning transaction is an important determinant of effective integration. This is because if educators have negative attitude they will automatically not affect the

integration. Related studies in other countries have indicated positive educators' attitude on the integration. A recent study of Alassaf (2014) at Jordanian universities found out that lecturers had positive attitude toward the integration. Particularly, they believe that the integration is beneficial in that it saves their time and efforts and it helps them to gain new knowledge and skills.

The power of ICT integration in student behavioral changes can further be seen in the Cone of Learning Experience, which was originally developed by Edgar Dale. The cone described various learning experiences as the results of the type of learning experiences by the learners. Essentially, the Cone shows the progression of experiences from the most concrete (at the bottom of the cone) to the most abstract (at the top of the cone).



Dale's Cone of Experience

Figure 1. Dales Cone of Learning Experience

3. Methodology of the Study

The study employed both descriptive and inferential statistics. Descriptive statistics analyzed research questions one and two while t-test, Analysis of Variance (ANOVA) and Pearson product correlation coefficient analyzed research question three to five, testing their subsequent null hypotheses.

3.1. Validity and Reliability

Researchers used their expertise to look at the content of questionnaire items and adjust where changes were deemed necessary. Ahuja (2003, p. 336) defines Reliability as the degree to which measures are free from error so that they give same results when repeated measurements are made under constant conditions". Mugenda and Mugenda (2003, p. 96) explains that "a coefficient of 0.80 or more implies that there is a high degree of reliability of the data." With the help of SPSS program, Cronbach alfa of .935 was obtained for competence items, .887 for application items, .893 for perception items and .919 for behavioral change items. This signifies that all the questionnaire items were highly reliable.

3.2. Data Gathering Procedures

After receiving permission from the University of Arusha Deputy Vice Chancellor for Academics, researchers used three-day faculty retreat that took place at Bagamoyo, Tanzania as an opportunity to distribute questionnaire and have the faculty members fill them. Available faculty members filled the questionnaires and returned them to the researchers at their earliest convenience.

4. Results and Discussion

Results and discussion section are guided by five research questions that steered this study. Mean scores of the respondents were interpreted as follows: 1.00-1.49 = Strongly Disagree, 1.50-2.49 = Disagree, 2.50-3.49 = Tend to Agree and 3.50-4.00 = Agree.

1. What is the competence level of university of Arusha educators in the use of ICT in teaching-learning transaction?

In this research question, competence in various ingredients of ICT integration was measured to ascertain the overall mean score of the University educators. Based on results in Table 1, educators' response to this question ranged from Disagree to Tend to Agree. Particularly, respondents disagreed to be knowledgeable with online marking (2.3714) and data management procedures (2.3889). On the other hand, the educators tended to agree to be competent in the use of PowerPoint program (2.7500), Excel program (2.7500), Microsoft Word

program (3.2286), online search procedures (3.0882) and internet program (2.9167).

Table 1. Descriptive Statistics for Educators Competence in the use of ICT in Teaching-Learning Transaction

| | N | Minimum | Maximum | Mean | Std. Deviation |
|-------------------------------------------------------------|----|---------|---------|--------|----------------|
| I am knowledgeable with online marking | 35 | 1.00 | 4.00 | 2.3714 | 1.19030 |
| I am competent in the use of PowerPoint program in teaching | 36 | 1.00 | 4.00 | 2.7500 | 1.05221 |
| I am competent in the use of Excel program | 36 | 1.00 | 4.00 | 2.7500 | .96732 |
| I am competent in the use of Microsoft word | 35 | 1.00 | 4.00 | 3.2286 | .94202 |
| I am knowledgeable with online search procedures | 34 | 1.00 | 4.00 | 3.0882 | 1.02596 |
| My internet competence is good enough | 36 | 1.00 | 4.00 | 2.9167 | 1.05221 |
| I am knowledgeable with data management procedures | 36 | 1.00 | 4.00 | 2.3889 | 1.04957 |
| Valid N (listwise) | 33 | | | | |

2. What is the attitude of University of Arusha educators on the place of ICT in students' behavioral change?

In this research question, attitude on the place of ICT on students' behavioral change was measured to ascertain the overall mean score of the University educators. The mean scores in this question ranged between the levels of Tend to Agree (2.50-3.49) and Agree (3.50-4.00). In particular, educators agreed that integration of computer

technology brightens up teaching learning sessions (3.6667). They also tended to agree that integration of computer technology makes learners actively involved in the teaching-learning transaction (3.3611), raises learners' curiosity (3.4167), makes learners more engaged (3.4444), reduces teachers domination (3.2286), speeds up students interaction (3.3333) and increases the rate of learner-learner and learner-teacher interaction (3.4167).

Table 2. Descriptive Statistics for Educators Attitude towards the Place of ICT in Students' Behavioral Change

| | N | Minimum | Maximum | Mean | Std. Deviation |
|----------------------------------------------------------------------------------|----|---------|---------|--------|----------------|
| Integration of computer technology brightens up teaching-learning session | 36 | 1.00 | 4.00 | 3.6667 | .63246 |
| The use of computer makes learners actively involved | 36 | 1.00 | 4.00 | 3.3611 | .79831 |
| The use of computer technology raises learners' curiosity | 36 | 1.00 | 4.00 | 3.4167 | .84092 |
| The use of computer technology makes learners more engaged | 36 | 1.00 | 4.00 | 3.4444 | .77254 |
| The use of computer technology reduces teachers' domination | 35 | 1.00 | 4.00 | 3.2286 | 1.00252 |
| The use of computer technology increases students' interaction | 36 | 1.00 | 4.00 | 3.3333 | .89443 |
| The Use of Computer Technology increases the rate of learner-teacher interaction | 36 | 1.00 | 4.00 | 3.4167 | .87423 |
| Valid N (listwise) | 35 | | | | |

3. Is there significant difference in the application of ICT in teaching-learning transaction by University of Arusha educators categorized according to gender, school/faculty, education level and training?

This research question called for testing of a null hypothesis which stated: There is no significant difference in the application of ICT in teaching-learning transaction by University of Arusha educators categorized according to gender, level of education and training.

In testing this null hypothesis, researchers employed t-test and One-way Analysis of Variance (ANOVA) to ascertain the differences in the application of ICT in teaching-learning transaction by educators based in

various categories in the aforementioned hypothesis. T-test in Table 3 indicates the mean score of 2.3890 for male educators and 2.3095 for female educators indicating that both groups disagreed to be applying ICT in teaching-learning transaction. Though the mean score of male educators seemed to be slightly higher than that of females, the Independent Sample t-test in Table 4 indicates the sig of .673, which is greater than the critical value, suggesting the difference in the application of ICT in teaching-learning transaction by University of Arusha educators categorized according to gender is not statistically significant.

Table 3. Group Statistics Application of ICT by Gender

| What is your gender? | | N | Mean | Std. Deviation | Std. Error Mean |
|-------------------------------------|--------|----|--------|----------------|-----------------|
| Application of computer in teaching | Male | 30 | 2.3890 | .85089 | .15535 |
| | Female | 6 | 2.3095 | .87792 | .35841 |

Table 4. Independent Samples Test Application of ICT by Gender

| | Levene's Test for Equality of Variances | t-test for Equality of Means | | | | | | | | |
|-------------------------------------|-----------------------------------------|------------------------------|------|------|-------|-----------------|-----------------|-----------------------|-------------------------------------------|---------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Application of computer in teaching | Equal variances assumed | .181 | .673 | .208 | 34 | .836 | .07952 | .38233 | -.69746 | .85651 |
| | Equal variances not assumed | | | .204 | 7.013 | .844 | .07952 | .39063 | -.84383 | 1.00288 |

As indicated by Table 5 and Table 6, One Way Analysis of Variance (ANOVA) was used to ascertain the differences in the application of ICT in teaching-learning process by educators categorized according to level of

education. According to Table 5, educators with Bachelor Degrees had the mean score of 2.4531, while those with Masters Degrees had the mean score of 2.3686 and those with Doctoral Degrees had the mean score of 2.2857.

Regardless of slight observed variations, the mean scores of all the groups fall within the range of 1.50-2.49 suggesting “Disagree.” The sig of .951 in Table 6, which is greater than the critical value, suggests no significant difference in the integration of ICT in teaching-learning

transaction by educators categorized according to their educational qualifications. This indicates that educators, regardless of their educational qualifications, disagreed to be integrating ICT in teaching-learning transaction.

Table 5. Descriptives Application of Computer in Teaching by level of Education

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|-----------|----|--------|----------------|------------|----------------------------------|-------------|---------|---------|
| | | | | | Lower Bound | Upper Bound | | |
| Bachelor | 7 | 2.4531 | .88915 | .33607 | 1.6307 | 3.2754 | 1.00 | 3.57 |
| Masters | 25 | 2.3686 | .83557 | .16711 | 2.0237 | 2.7135 | 1.00 | 4.00 |
| Doctorate | 4 | 2.2857 | 1.04978 | .52489 | .6153 | 3.9562 | 1.00 | 3.57 |
| Total | 36 | 2.3758 | .84315 | .14053 | 2.0905 | 2.6611 | 1.00 | 4.00 |

Table 6. ANOVA Application of ICT by Educators’ Level of Education

| | Sum of Squares | df | Mean Square | F | Sig. |
|----------------|----------------|----|-------------|------|------|
| Between Groups | .076 | 2 | .038 | .050 | .951 |
| Within Groups | 24.806 | 33 | .752 | | |
| Total | 24.882 | 35 | | | |

T-test was used to ascertain the differences in the application of ICT in teaching- learning transaction by the university educators categorized according to training in ICT application. As indicated in Table 7, thirty educators (83.3%) had gone through ICT training while 6 (16.7) never went through ICT training. The educators who went through computer training had the mean score of 2.4841, which is seemingly greater than that of those who never

went through computer training (1.8341). Here, we come to realize that both mean scores fall within the range of disagree. Furthermore, the sig of 0.77, which is greater than the critical value leads us to infer that there is no significant difference in the application of ICT in teaching-learning transaction by University of Arusha educators categorized according to training.

Table 7. Group Statistics Application of ICT by Training

| | Training | N | Mean | Std. Deviation | Std. Error Mean |
|-------------------------------------|----------|----|--------|----------------|-----------------|
| Application of computer in teaching | Yes | 30 | 2.4841 | .85037 | .15526 |
| | No | 6 | 1.8341 | .59970 | .24483 |

4. Is there significant difference in the perception of usefulness of ICT in teaching-learning transaction by University of Arusha educators categorized according to gender, education level and training?

This research question called for testing of a null hypothesis which stated: *There is no significant difference in the perception of usefulness of ICT in teaching-learning transaction by University educators categorized according to gender.*

In testing this null hypothesis, researchers employed t-test and One- way Analysis of Variance (ANOVA) to ascertain perception of usefulness of ICT in teaching-learning transaction by educators in various categories as appears in the hypothesis. According to t-test results in

Table 9, the male educators seem to have the mean score of 3.3733 in their perception of usefulness of ICT resources in teaching-learning transaction which is slightly lesser than that of female educators (3.3889). Out of these results we come to realize that both mean scores fall within the range of 2.51 to 3.49, which means both groups agreed that ICT integration is useful in teaching-learning transaction. The sig of .224 in Table 10, is greater than the critical value of .005 suggesting that we accept the null hypothesis which states that there is no significant difference in the perception of usefulness of ICT in teaching-learning transaction by University educators categorized according to gender.

Table 8. Independent Samples Test Application of ICT by Training

| | Levene's Test for Equality of Variances | t-test for Equality of Means | | | | | | | | |
|-------------------------------------|-----------------------------------------|------------------------------|------|-------|-------|-----------------|-----------------|-----------------------|-------------------------------------------|---------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Application of computer in teaching | Equal variances assumed | 3.334 | .077 | 1.776 | 34 | .085 | .65000 | .36597 | -.09375 | 1.39375 |
| | Equal variances not assumed | | | 2.242 | 9.563 | .050 | .65000 | .28990 | .00003 | 1.29997 |

Table 9. Group Statistics Usefulness of ICT integration by gender

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|--------------------------------------|--------|----|--------|----------------|-----------------|
| Perception of usefulness of computer | Male | 30 | 3.3733 | .77861 | .14215 |
| | Female | 6 | 3.3889 | .43033 | .17568 |

Table 10. Independent Samples Test Usefulness of ICT integration by gender

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|--------------------------------------|-----------------------------|-----------------------------------------|------|------------------------------|--------|-----------------|-----------------|-----------------------|-------------------------------------------|--------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Perception of usefulness of computer | Equal variances assumed | 1.535 | .224 | -.047 | 34 | .963 | -.01556 | .32994 | -.68608 | .65497 |
| | Equal variances not assumed | | | -.069 | 12.749 | .946 | -.01556 | .22599 | -.50476 | .47365 |

As seen in Table 11, the mean score of all the educational level categories fall within the range of 2.50-3.49 which means "Tend to Agree." However, trends in perception of usefulness of ICT integration in teaching-learning transaction by educational level seem to be inconsistent in that bachelor degree holders have the mean score of 3.2143, which is slightly lower than that of Masters' Degree holders (3.4547). The mean score of

Doctorate holders (3.1667 is less than that of masters degree and Bachelor Degree holders. The sig of .629 in Table 12, however, which is greater than the critical value, leads us to accept the null hypothesis and therefore hold that the difference in the perception of usefulness of ICT in teaching-learning transaction by University educators categorized according to education level is statistically insignificant.

Table 11. Descriptives Usefulness of ICT by Level of Education

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|-----------|----|--------|----------------|------------|----------------------------------|-------------|---------|---------|
| | | | | | Lower Bound | Upper Bound | | |
| Bachelor | 7 | 3.2143 | .88042 | .33277 | 2.4000 | 4.0285 | 1.50 | 4.00 |
| Masters | 25 | 3.4547 | .72200 | .14440 | 3.1566 | 3.7527 | 1.00 | 4.00 |
| Doctorate | 4 | 3.1667 | .52705 | .26352 | 2.3280 | 4.0053 | 2.67 | 3.83 |
| Total | 36 | 3.3759 | .72719 | .12120 | 3.1299 | 3.6220 | 1.00 | 4.00 |

Table 12. ANOVA Usefulness of ICT by Level of Education

| | Sum of Squares | df | Mean Square | F | Sig. |
|----------------|----------------|----|-------------|------|------|
| Between Groups | .513 | 2 | .257 | .470 | .629 |
| Within Groups | 17.995 | 33 | .545 | | |
| Total | 18.508 | 35 | | | |

Table 13. Group Statistics Usefulness of ICT integration by Training

| | Training | N | Mean | Std. Deviation | Std. Error Mean |
|--------------------------------------|----------|----|--------|----------------|-----------------|
| Perception of usefulness of computer | Yes | 30 | 3.3444 | .77179 | .14091 |
| | No | 6 | 3.5333 | .45947 | .18758 |

Regarding perception of usefulness of ICT integration in teaching-learning transaction by educators categorized according to ICT training, we note that both groups agreed that ICT integration is useful with slightly different mean scores of 3.5333 and 3.3444 respectively, the mean score

of those who never went through ICT training being greater than that of their counterparts. The sig of .273 in Table 14, however, suggests that the difference of mean scores in the perception is statistically insignificant. Thus both groups regarded ICT integration as important.

Table 14. Independent Samples Test Usefulness of ICT Integration by Training

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|--------------------------------------|-----------------------------|-----------------------------------------|------|------------------------------|--------|-----------------|-----------------|-----------------------|-------------------------------------------|--------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Perception of usefulness of computer | Equal variances assumed | 1.241 | .273 | -.575 | 34 | .569 | -.18889 | .32836 | -.85620 | .47842 |
| | Equal variances not assumed | | | -.805 | 11.598 | .437 | -.18889 | .23461 | -.70202 | .32425 |

5. Is there significant relationship between competence and application of ICT in teaching-learning transaction?

This research question called for testing of a null hypothesis which stated: *There is no significant relationship between competence and application of ICT in teaching-learning transaction.* In testing this hypothesis,

researchers employed Pearson-product moment correlation coefficient as seen in Table 15 which indicates a positive and strong relationship between competence and application of ICT in teaching-learning transaction at 0.01 level of significance. This implies that the higher the competence, the likelihood of educators to integrate ICT in teaching-learning transaction.

Table 15. Correlation between Competence and Application of ICT

| | Competence in the use of Computer | Application of computer in teaching |
|-------------------------------------|-----------------------------------|-------------------------------------|
| Competence in the use of Computer | Pearson Correlation | .813** |
| | Sig. (2-tailed) | .000 |
| | N | 36 |
| Application of computer in teaching | Pearson Correlation | .813** |
| | Sig. (2-tailed) | .000 |
| | N | 36 |

** Correlation is significant at the 0.01 level (2-tailed).

5. Summary, Conclusion and Recommendations

In summary, University of Arusha educators are competent in the use of PowerPoint, Excel, Microsoft Word, online search procedures and internet programs. The educators contended that ICT integration brightens up teaching learning sessions, makes learners actively involved in the teaching-learning transaction, raises learners' curiosity, makes learners more engaged, reduces teacher domination, speeds up interaction and increases the rate of interaction among students and between students and educators. Although majority of educators have gone through ICT training, they lack skills in online marking and data management procedures. Despite training and positive attitude toward ICT integration, educators, regardless of their educational background, do not integrate ICT in teaching learning processes. The difference in the perception of usefulness of ICT in teaching-learning transaction by University educators categorized according to gender, educational level and ICT training is not statistically significant. Finally, the study established a positive and strong relationship between competence and application of ICT in teaching-learning transaction. This implies that the higher the competence, the likelihood of educators to integrate ICT in teaching-learning transaction.

References

- Ahuja, R. (2003). *Research methods*. New Delhi: Rawat Publications.
- Ajoku, L. I (2014). *The Place of ICT in Teacher Preparation and Climate Change Curriculum at the Tertiary Education Level in Nigeria*. Journal of Education and Practice. Vol.5, No.13, 2014185.
- Alassaf, H.A (2014). Effective Strategies on Using ICT for Teaching and learning Undergraduate Level at Jordanian Universities. Journal of Education and Practice. Vol.5, No.3, 201481.
- Alavi, M. (1994). *Computer-mediated collaborative learning: An empirical evaluation*. MIS Quarterly, 18(2), 159-174.
- Angrist, J. D. and Lavy, V. (2002). "New Evidence on Classroom Computers and Pupils' Learning". *Economic Journal*. No. 112, pp. 735-765.
- Atsumbe, B. N; Raymond, E; Enoch, E. B and Duhu, P (2014). Availability and Utilization of e-Learning Infrastructures in Federal University of Technology, Minna. Journal of Education and Practice.
- Banerjee, A.; Cole, S.; Duflo, E. and Linden, I. (2004). "Remedying Education: Evidence from Two Randomized Experiments in India" [mimeo]. MIT.
- Coates, D. and Humphreys, B. R. (2004). "'No Significant Distance' between Face-to-face and Online Instruction: Evidence from Principles of Economics". *Economics of Education Review*. Vol. 23, no. 6, pp 533-546.
- Fallows and Bhanot (2005). Quality Issues in ICT-Based Higher education (Online book. New York: Routledge. <http://www.questia.com/read/108944825/quality-issues-in-ict-based-Higher-education>.
- Fuchs, T. and Woessmann, I. (2004). "Computers and Student Learning: Bivariate and Multivariate Evidence on the Availability and Use of Computers at Home and at School", *CESifo Working Paper*. No. 1321. November. Munich.
- Gagne, R. M., Wager, W.W., Golas, K. C. & Keller, J. M (2005). *Principles of Instructional Design* (5th edition). California: Wadsworth.
- Goolsbee, A., Guryan, J. (2002). "The Impact of Internet Subsidies in Public Schools". *NBER Working Paper*. No. 9090.
- Hiltz, H. L. Teles, S. R. L. & Turoff, M. (1995). *Learning Networks: A Field Guide to Teaching and Learning Online*. Cambridge, MA: MIT Press
- Joy, E and Ishikaku, E. C (2012). *Integration of Information and Communication Technology (ICT) in Teacher Education for Capacity Building*. Journal of Education and Practice. Vol. 3, No 10, 2012.
- Kearsley, G. (1997). The Virtual Professor: A Personal Case Study. <http://home.sprynet.com/~gkearsley/virtual.htm>.
- kulik, J. A. (1994). "Meta-analysis Study of Findings on Computer-based Instruction". *Technology Assessment in Education and Training*. Hillsdale, NJ: Lawrence Erlbaum.
- Larkin, J. H and Chabay, R. W (1992). Computer-assisted instruction and intelligent tutoring systems: shared goals and complementary approaches (online book). Hillside, NJ: Lawrence Erlbaum. <http://www.questia.com/read/98179996/computer-assisted-instruction-and-intelligent-tutoring>.
- Marshal, S and Taylor, W (2005). *Collaboration as a critical success factor in using ICT for Capacity building and community development*. International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2005, Vol. 1, Issue I, pp. 2-4.
- Moore, K.D (2009). *Effective Instructional Strategies*. Los Angeles: SAGE.
- Mugenda, O. M. & Mugenda, A. G. (2003). *Research methods: Quantitative and qualitative Approaches*. Nairobi: African Centre for Technology Studies.
- Sharma, A; Gandhar, K and Sharma, S (2011). *Role of ICT in the Process of Teaching and Learning* Journal of Education and Practice. 2(5) 2011.
- Shneiderman, B. (1988). *Relate-Create-Donate: An educational philosophy for the cyber-generation*. Computers & Education, in press.

- [23] Shneiderman, B., Alavi, M., Norman, K. & Borkowski, E. (Nov 1995). Windows of opportunity in electronic classrooms, *Communications of the ACM*, 38(11), 19-24.
- [24] Slavin, Robert E (2009). *Educational Psychology: Theory and Practice*. New Jersey: Pearson Education, Inc.
- [25] Sosin, K.; Blecha, B. J.; Agawal, R.; Bartlett, R. L.; Daniel, J. I. (2004). "Efficiency in the Use of Technology in Economic Education: Some Preliminary Results". *American Economic Review*. May 2004 (Papers and Proceedings), pp. 253-258.
- [26] Tuckman, B. W and Monetti, D. M (2011). *Educational Psychology International Edition*. United States: Wadsworth.
- [27] Turoff, M. Harasim, L., Hiltz, S.R., & Teles, L. (1995). *Learning Net-works: A Field Guide to Teaching and Learning Online*. Cambridge, MA: MIT Press.
- [28] Wilen-Daugenti, T and McKee, A. G (2008). *21st Century Trends for Higher Education Top Trends, 2008-2009*. Retrieved from http://www.cisco.com/web/about/ac79/docs/wp/21st_Century_Top_Trends_POV_0811.pdf.
- [29] Yusufu, I; Kajuru, Y. K and Musa, M (2014). *Effect of a Computer Mediated Systems Teaching Approach on Attitude Towards Mathematics of Engineering Students*. *Journal of Education and Practice*. 5 (9), 201418.