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USABILITY OF COMPUTERS IN TEACHING AND LEARNING AT TERTIARY INSTITUTIONS IN UGANDA

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Abstract
Since a computer-enriched learning environment is positively correlated with users' attitudes towards computers in general, the rationale of this study was to investigate the extent to which computers were applied in the teaching and learning at tertiary-level institutions; specifically at the Core Primary Teachers' Colleges (PTCs). The study accordingly set out to examine this duo-fold ideal at Shimoni and Kibuli Core PTCs; both in Kampala District in Uganda. The specific objectives were to find out the level to which computers have been integrated in teaching and leaning at PTCs and to determine the competency of both the tutors and the students in the use of information and communication technology (ICT). Both categories served as respondents to whom a questionnaire was subjected. Findings indicated that although computers were generally being integrated in the teaching process, there was need for more guidance and support to ensure expertise of both tutors and students in the use of ICT. This article is cognizant that integration of technology requires a move from the traditional model of teacher presentation to a learning model whereby students draw information relevant to their future profession.
Keywords: Computer science, Connect-ED, Core PTC, higher education, ICT, tertiary education, Uganda primary teacher college.

Introduction
Teacher education in Uganda as of 2000 provided both pre-service and in-service training through not less than 539 primary school centres and tutors radiating from 23 Primary Teacher Colleges serving all schools in the country (Ministry of Education and Sports, 2000). Accordingly, the Connectivity for Educators (Connect-ED) Project established computer-assisted teacher training laboratories and Internet Connectivity in four pilot Primary Teacher Colleges in

Gulu, Bushenyi and Kampala. The project aimed at providing computer skills training to student teachers, as well as establishing computer laboratories and Internet Connectivity to the eight Core Primary Teachers' Colleges (PTCs) around the country; of which Shimoni and Kibuli were accorded first priority. In an interview with Professor Lutalo-Bbosa, the former Vice Chancellor of Kyambogo University, the objective of Connect-ED was to introduce integration of computers into the teaching methods employed in primary schools and to provide capacity building to administrators, tutors, and pre-service and in-service teachers within the PTCs.

Connect-ED activity, funded by the Education for Development and Democracy Initiative (EDDI), therefore aimed at enriching primary education through the use of new information technologies in the education system. This included providing computer skills training to student teachers, establishing computer laboratories, and Internet Connectivity to the eight Core Primary Teacher Training Colleges around the country.

Connect-ED was a multi-faceted strategy to increase the access and use of internet connectivity by education stakeholders in rural Uganda. This article posits that technology integration requires a move from the traditional model of teacher presentation, student practice and student application to a learning model where students use reasoning skills to generate rich, complex, and meaningful understanding of information relevant to their future profession (Simpson, Payne, Munro, and Hughes, 1999). Students who experience this newer model come to see that teachers learn as they teach and they are more likely to interact with their own students in the same way. According to Murphy and Greenwood (1998), although teachers do aspire to the learner-centered approach they employed limited use of multimedia and they only minimally encouraged students to use ICT. Based on these observations, it is necessary to probe the extent of usability of computers in the teaching and learning process at the tertiary-level institutions in Uganda.

The term *tertiary education* is used in Uganda as synonymous with *higher education* (Education Review Commission Report, 1989 and Government White Paper, 1992) and refers to the level of education offered beyond full secondary education including Universities (Tiberondwa, 1999). Suffice to note that the two terms are used similarly in the United States.

Method

Relevant literature to the study was reviewed and was incorporated into the discussion of findings. The study adopted a cross-sectional research design with the use of a close-ended questionnaire. Respondents were randomly sampled with some instances of convenient sampling technique. Data was obtained from a total of twenty (20) tutors and fifty (50) students; each of the two institution being represented by a half of each category of respondents.

The content validity index (CVI) of the questionnaire was computed using the formula:

$$\text{CVI} = \frac{\text{Number of items rated as relevant}}{\text{Total number of items in the questionnaire}}$$

$$= \underline{20} = \underline{\underline{0.714}}$$

Cronbach's Alpha Coefficient Test indicated that the instrument used was reliable.
An observation list and casual interactions with people at the colleges also helped corroborate the findings.

Results

The study utilized, as respondents, the academic staff and the students at two tertiary institutions; namely Shimoni Core PTC and Kibuli Core PTC. On the side of the staff, characteristics that were considered relevant for the study were: gender, age, highest level of education, experience in teaching service, and experience in computer and incorporation of computer facilities in teaching as depicted in tables 1 through 6. Tables 7 through 10 present students' responses that include their level of study at the respective colleges, previous knowledge about computers, and utilization of computer applications.

Table 1: Staff Gender of respondents

			College	
			Shimoni	Kibuli
Sex	Male	Frequency	7	4
		Percentage	63.6%	33.3%
	Female	Frequency	3	6
		Percentage	36.4%	66.7%

Table 1 shows that at Shimoni PTC, the male tutors participated in the study with a frequency of 7 (63.6%) while at Kibuli PTC the female gender was represented by a frequency of 6 (66.7%).

Table 2: Staff Age of Respondents

			College	
			Shimoni	Kibuli
Age	20-35	Frequency	4	
		Percentage	40.0%	
	36-55	Frequency	3	7
		Percentage	30.0%	70.0%
	Above 55	Frequency	3	3
		Percentage	30.0%	30.0%

In Table 2, conspicuous is the outstanding age bracket of 36-55 where the tutors in Kibuli were represented by 70%, while Shimoni was represented a majority between the ages of 20 to 35 (40%) though this age group was below average percentage.

Table 3: Staff Respondents Highest Level of Education

			College	
			Shimoni	Kibuli
Highest level of education	Diploma	Frequency	5	2
		Percentage	50.0%	20.0%
	Degree	Frequency	2	5
		Percentage	20.0%	50.0%
	Post graduate	Frequency	3	3
		Percentage	30.0%	30.0%

Table 3 reveals that the diploma holders lead in Shimoni PTC with a frequency of 5 (50%), while Kibuli PTC had a majority of degree holders at 5 (50%).

Table 4: Staff Respondents Experience in Teaching Service

		College			
		Shimoni		Kibuli	
		Frequency	Percentage	Frequency	Percentage
Experience in the teaching service	2 years	2	20.0%	2	20.0%
	3 years	3	30.0%		
	4 years	1	10.0%	3	30.0%
	>4 years	4	40.0%	5	50.0%

According to table 4 tutors whose experience in the teaching service measured above four years were only 5 (50%) for Kibuli and only 4 (40%) for Shimoni.

Table 5: Staff Respondents Computer Experience

			College	
			Shimoni	Kibuli
Have you had any experience with computers before training?	Yes	Frequency	3	6
		Percentage	36.4%	66.7%
	No	Frequency	7	4
		Percentage	63.6%	33.3%

Table 5 depicts respondents who had prior experience in computers with a frequency of 6 (66.7%) for Kibuli PTC and only 3 (36.7) for Shimoni PTC.

Table 6: Staff Responses Computer Facilities

			College	
			Shimoni	Kibuli
Computer facilities are appropriate for tutors and students	Strongly agree	Frequency	7	4
		Percentage	63.6%	33.3%
	Agree	Frequency	3	6
		Percentage	36.4%	66.7%

According to table 6 (63.6%) tutors from Shimoni strongly agreed that facilities were appropriate. This position was affirmed to by 4 tutors (33.3%) at Kibuli.

Table 7: Student Respondents' College

	Frequency	Percentage
Shimoni	25	50.0
Kibuli	25	50.0
Total	50	100.0

Table 7 lists 25 (50.0%) students as sampled from each of the two PTCs for a total of 50 students.

Table 8: Students' Level of Study at PTC

			College	
			Shimoni	Kibuli
What is your level of study at the College?	1st year	Frequency	4	14
		Percentage	16.0%	56.0%
	2nd year	Frequency	21	11
		Percentage	84.0%	44.0%%

Table 8 registers that the majority of the respondents (84.0%) were in their second year at Shimoni PTC, while Kibuli PTC's students were an above average percentage (56.0%) in their first year.

Table 9: Students' Previous Knowledge about Computers

			College	
			Shimoni	Kibuli
Do you have any previous knowledge about using computers?	Yes	Frequency	14	18
		Percentage	56.0%	72.0%
	No	Frequency	11	7
		Percentage	44.0%	28.0%

In table 9 students with previous experience in using computers were represented by a frequency of 14 (56.0%) for Shimoni PTC and 18 (72.0%) for Kibuli PTC. These high percentages may be due to the fact that the tutors were involved in a task at the time to integrate computers into the teaching and learning process.

Table 10: Use of Computer Applications

			College	
			Shimoni	Kibuli
How long have you been using computers (i.e. word, Excel, Internet)	Less than 1 year	Frequency	19	5
		Percentage	76.0%	20.0%
	1Year	Frequency	5	10
		Percentage	20.0%	40.0%
	More than 2 years	Frequency	1	10
		Percentage	4.0%	40.0%

According to table 10 Kibuli had 10 (40.0%) student respondents who had used computers for more than 2 years compared to only 1 (4.0%) student respondent from Shimoni. It was found that the respondents were only familiar with Microsoft applications and the internet. Casual interactions revealed as well that the respondents rated themselves as beginners in the use of computers. In fact all expressed the need for extra training and assistance in using computers. They confessed to being highly motivated to what may be called the existential ICT craze.

Observations

Observation confirmed that the two tertiary institutions possessed computers, ranging from 10 to 15 in number for each institution. Both had Local Area Network (LAN) and Wide Area Network (WAN). The quality of digitalized learning materials and interactivity in learning materials was commendable for both colleges. In fact, these institutions had received a donation from Connect-Ed that included overhead projectors, heavy duty photocopiers, printers, Internet, computers, educational software, and online tools. Interactivity in learning materials was also observed. Students were seen using programs like Microsoft Office package, Internet services, and computer games.

Workshops and training in ICT were rated medium in Kibuli and high in Shimoni. The latter college carried out such schedules during holidays while at Kibuli’s workshops and training took place once at the end of every academic year.

This article proposes the above implementation of ICT for all colleges, and indeed all tertiary institutions, since digitalized technology makes informational content easier to find, access, manipulate, remix, and even to disseminate throughout the teaching and learning process.

Discussion

Gibson (2001) observes that most teachers use a variation of the teacher-centered model, where the emphasis is upon the presentation of a body of knowledge or a set of skills that students are to learn. Accordingly, this study found out that to integrate technology into classroom practice, teachers must make two radical changes. They must they learn how to use technology; and they must also fundamentally change how they teach. Hence, teacher anxiety about computers and overall attitude toward technology can influence the use of computers in the classroom, and, thus, the success of technology integration into the curriculum. Teachers can be expected to have the same traits as adult learners in general: (a) their past experiences serve as a resource to support new learning, (b) they are ready to learn when there is an identified need to know, and (c) they also learn what they perceive to have importance in helping them deal with problems they confront in life (Knowles, 1990).

The findings as well corroborated the studies by Storck and Hill (2000) regarding the use of multimedia as a teaching tool that indicated teachers need to move through different stages of ICT proficiency and need to understand that the introduction of ICT into the classroom changes the dynamics of the classroom and impacts classroom management. This suggests a definite paradigm shift in approach to teaching and teacher attitudes towards the use of ICT in the classroom.

In addition the use of the Internet for teaching and learning purposes has received increasing attention over the recent years. Mitra and Stefensmeier (2000) concluded that a networked learning institution where students have easy access to computers could foster positive attitudes toward the use of computers in teaching and learning. They found that a computer-enriched learning environment was positively correlated with students’ attitudes towards computers in general, and the role of computers in facilitating teaching and learning. Liu, Macmillan, and Timmons (1998) perceived integrating computers into a learning system as a complex instructional system in which student learning is impacted by lecturers, students, administrative and technical staff, computer hardware and software resources, and the computer laboratory and classroom settings. They reported that students’ with positive attitudes toward using computers also have positive attitudes toward using computers for their learning.

This article advances the perception of Coombs (1999) that new educational tools, which drive multimedia presentations, offer educators a unique opportunity to design ICT focused learning environments using multimedia to encourage synergy between ICT skills and learning outcomes through student- centred multimedia projects. Such multimedia environments can lead to greater interest that can lead to greater understanding and ultimately to greater success in defining and developing ICT strategies to the benefit of the learner. Moreover, successful integration takes place when technology becomes transparent and both the teacher and students can concentrate on the content of the course and makes it possible for students to use computers in the natural flow of classroom activities (Brunner, 1990; Rieber, 1994; Partee, 1996). Accordingly, the impact of the computer depends on the developmental level of the school in the due regard.

The findings further revealed that there was urgency for teachers to be adequately knowledgeable in ICT if they are to have any competitive edge in the world of education today. To this end a new syllabus on Computer Science was recently developed for primary schools in Uganda. For this syllabus to be effectively implemented the teachers involved must have knowledge and experience in computers. One way of achieving this is by integrating computers in the dual process of teaching and learning. This, as a matter of course, has a lot of financial and management implications for all distance educators, but it ought to be a priority.

Based on the study, the respondents did vary in relation to skills and experience in computer usage. Regarding such a scenario Morrison (1989) emphasised the use of computers dependent on the level of experience for both tutors and students. But as fate always has it, tutors with the greater experience in teaching also proved to be the most vehemently opposed to any new changes being introduced in the system. As such the authors of this study believe that the status quo is likely to change over time. For, as according to Phelps (2004) if too limited a period is allowed to implement change it can lead to confidence constraints that will inhibit resource use, as in this case the use of computer technology.

The study found out that there were other obstacles towards usability of computers in PTCs. For instance, the computers were very few in number compared to the number of users. In addition to problems with intermittent power shortages, the speeds at which internet facilities operated tended to be one of the factors that negatively affected both tutors and students in their usage of computers. And, in justification of the lament of Smerdon, Cronen, Lanahan, Anderson, Lannotti, & Angeles (2000), printing problems and scanning were at times inaccessible due to bureaucracy and congestion in computer labs and offices. Inadequacy of resources and materials created a conspicuous mismatch in the teaching and learning process at these PTC institutions.

Conclusion

Wider connectivity and the efficient deployment of ICTs within developing countries, according to Adam (1996) would improve the overall information infrastructure and thereby promote positive changes in socio-economic development. The foregoing is a truism in the case of Uganda. As subscribed to by Neema-Abooki (2009), ICT is apt to being utilized in several ways to improve people's health and wealth as it enables organisations to provide better services to the benefit of the entire society. While the transformation of education is a major issue among the many practical revolutions engineered by computer technology, the challenge is for all levels of education, tertiary or otherwise, to integrate new ICT approaches in science and technology and across other disciplines. This ICT "techno-science" is indispensable for the integral development of the people and the country.

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