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Implementation Of ICT In Learning: A Study Of Students In Ghanaian Secondary Schools.

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Abstract

This study was conducted to investigate secondary school students' use of ICT and the factors that relate to their technology use. A total of 3380 students from 24 public and private schools from four regions in Ghana participated in this study. Descriptive statistics, Analysis of variance and multiple regression analysis were used to analyze the findings. The study found that majority of the students used ICT to communicate with peers more than other types of ICT application. However, the study revealed that students' pedagogical use of ICT was low. The analysis showed that students in public schools pedagogically use ICT more than students in private schools. In addition, urban school students pedagogically use ICT more than semi-urban and rural school students. Finally, the findings indicated that students' ICT competencies were the most predictor of their technology use. The findings of this study have added to the body of knowledge documenting the fact that digital divide continues to exist.

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1. Background of the Study

Countries around the world have realized the opportunities of the emerging information age characterized by information and communication technologies (ICTs). These technologies are driving national development efforts globally and a number of developed and developing nations are exploring ways of facilitating their development process through the development, deployment and the exploitation of ICTs within their economies and societies. As

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part of the Government of Ghana's commitment to a comprehensive programme of rapid deployment, utilization and exploitation of ICTs within educational sector and other sectors in the country, a National ICT Policy and Plan Development Committee was set up in 2002 to formulate ICT policy referred to as Information and Communication Technology for Accelerated Development (ICT4AD) (Ministry of Education, 2003) which was approved and adopted in 2004. This policy takes into consideration the provision of key socio-economic development framework documents such as Vision 2020. ICT4AD provided the basis for Ghana's vision for the information age. The ICT4AD document identified 14 priority focus areas and one of the areas was promoting ICTs in education by the deployment and exploitation of ICTs in education. The ICT4AD focused on the development and implementation of ICTs in education by prioritizing training, research and generation of resources for expansion of ICTs. The objective of this policy is to improve human technical expertise and the training of facilitators and experts in the applications of ICTs in education. In furtherance to this, the Government of Ghana set up a committee to review the whole educational system and recommend ways to integrate ICTs in Ghanaian education. Working under the theme "Meeting the challenges of education in the twenty-first century" the committee recommended educational reforms that would be technology driven. Aside from proposing reforms in the current educational structure, the committee's proposals on technology driven education included: the expansion of distance education initiatives, the establishment of Open Colleges that would collaborate with industry and provide more education opportunities for Ghanaians, the establishment of digital libraries and information services at institutes of learning, and finally the prioritization and promotion of Science and Technology in Ghana. To meet the challenges of education in the 21st, the Ministry of Education (MoE, 2008) formulated a draft policy titled: "ICT in Education Policy", policy framework describing how ICTs should be introduced and implemented in second-cycle institutions. The policy proposed the introduction of ICT as a core subject, the introduction of ICT as an elective subject, the integration of ICTs as a teaching tool for all subject areas and the integration of ICTs to support educational management and administrative functions. As a follow up to this document, MoE conducted a research in 2009 under the theme "e-Readiness Assessment of second-cycle institutions in Ghana". The objective of this base line study was to "examine and establish the extent to which ICTs are being exploited and deployed to facilitate education and training efforts within the country" (MoE, 2009, p. 22). According to the survey report, the level of computer literacy is low in the country and this has been identified as one of the key factors limiting the utilization of ICTs in education. Therefore, this study intended to investigate secondary school students' use of ICT. This study also sought to investigate the differences in technology use in terms of school type and location as well as the factors that relate to their technology use.

2. Literature Review

2.1 ICT integration into teaching and learning

There have been many studies on students' integration of ICT into learning worldwide. For instance, a study conducted by Kennedy, Judd, Churchward and Grey, (2008) on 2000 Australian students revealed that some students use computer for general study purposes, others use computer to develop web pages but a great number of students use computer to play music everyday or once a week. Further and Kvavik, (2005) conducted a study on 4374 students to investigate their use of ICT in school. The study found that students frequently use ICT for email, instant messaging, word processing and internet surfing. Again, Zakaria, Watson and Edwards (2010) conducted a research on Malaysian students' use of ICT in schools. The result showed that students use email to disseminate and share digital contents. In a similar study, Yukhymenko and Brown, (2009) investigated the use of ICT among 122 Ukranian high school students. The result found that 53.3% of the students use ICT in school once a week but 33.5% indicated that they never use ICT in school. However, the study was silent on what the students use ICT for in schools. As a comparison with advanced countries, the technology use in education in developing countries is relatively limited. Though, there is much information on the availability of ICT and the way they are being implemented in advanced nations, there is little information in the literature on the use of ICT among students in schools in Africa in general, and especially Ghana (Beukes-Amiss and Chiware, 2007). In Ethiopia, Woreta, Kebede and Zegeye, (2013) surveyed the knowledge and utilization of ICT among 1096 students. The result showed that 33% of the students use a computer once a week and almost 41% of the students a computer once in a month.

Nearly half of the students (47%) never use ICT. In addition, the result revealed that most of the students (51%) use ICT for email or instant messaging. Further, in Nigeria, Tella et al,. (2007) conducted a study on the use of ICT among 700 teachers. The study found that 61% of the teachers have access to computers. However, the result did not indicate the use of ICT among students. Similarly, Sarfo and Ansong-Gyimah, (2011) surveyed a study on access to ICT and experiences in the use of ICT among 300 students in Ghanaian second-cycle schools. The result revealed that the students have been using mobile phone, computer or internet. In addition, the result showed that reasonably number of the students have access to computers and often use it to gain computer knowledge. However, the result was silent on the use of ICT in terms of the type of school the students attend and the geographical location of the schools (i.e. urban, semi-urban and rural). Additionally, the study was silent on the factors relating to the use of ICT among students. Therefore, the purpose of this study is to investigate secondary school students' use of ICT, the differences in their technology use in terms of school type and location and the factors that relate to their technology use. To achieve the research purpose, the three research questions were addressed:

3. Research Questions

In this study, three research questions were addressed.
(1) How is ICT used by students to support learning processes in classroom?

(2) Are there any significant differences in students' pedagogical use of ICT in terms of school type and school location?

(3) What is the relative importance of factors relating to students' pedagogical use of ICT in learning?

4. Methodology

In this study, 24 public and private secondary schools were selected from four regions. The selection of schools was based on student-computer ratio (MoE, 2009) and the information provided by the school heads. The schools comprised three public secondary schools and three private secondary schools in each region. The categorization of the schools was urban schools, semi-urban schools and rural schools. A total of 4350 questionnaires were received, representing 96.7% return rate from 4500 questionnaires distributed to students. Of these, 132 questionnaires were deemed unusable, due to data incompleteness, and were subsequently dropped from the data set leaving 4218 questionnaires for data screening. Of these, 838 questionnaires were detected as outliers and deleted from the data set leaving 3380 questionnaires for the data analysis. A table of values of sample size determination developed by Krejcie and Morgan (1970) was used to determine the sample size of respondents in each school. The questionnaire consists of 35 items and was categorized into three sections. Section A consists of nine demographic items, section B consists of six students' use of ICT and Section C consists of 23 items of factors that related to students' use of ICT.

5. Data Analyses

Data were analyzed using descriptive statistics, factorial analysis of variances (ANOVA), and multiple regression. Descriptive statistics was used to analyze the demographics of the participants and, research question 1. Factorial ANOVA was used to answer research question 2 (Tabachnick and Fidell, 2012). Multiple regression analysis was used to analyze research question 3. SPSS 16 was used to perform all the analysis.

6. Research Findings

Of 3380 respondents, 51.5% were females and 48.5% were males. The age of the students ranged from 13 to over 20 years. 47.3% were between 17 and 18 years old. 6.4% were over 20 years old. 62.6% of the students were

enrolled in public schools while 37.4% were enrolled in private schools. 33.0% of the students came from urban, 37.3% from semi-urban and 29.7% from rural schools. In terms of program of study, 42.7% offer Arts, 20.9% study Science, 18.2% study Business, and 14.1% study Home Economics and3.8% study other programs. In terms of ICT experience, 26.2% had between 3-4 years ICT experience, 26% with more than six years experience, 15.9% had between 5-6 years experience, 18% had 1-2 years ICT experience, while 12.9% had less than 1 year ICT experience.

Research Question 1: Student's pedagogical use of ICT in learning

As seen in Table 1, majority of the respondents used ICT to communicate with peers (64.2%) more than other types of ICT application. However, respondents' use of ICT to support their learning varies as follows: 34.3% never use ICT, whereas 20.5% use ICT daily. The overall pedagogical use of ICT for learning purposes was found to be low (mean = 2.74, standard deviation = 1.51).

Table 1. Students' pedagogical use of ICT

Item	Percentage (%)					Mean	Std
	Never	Once a month	Once a week	Twice a week	Daily		
Download learning materials	35.1	18.1	18.8	13.9	13.0	2.51	1.42
Give presentation of class work	47.0	17.7	17.0	10.2	7.1	2.12	1.30
Complete assignments	37.4	14.6	17.2	10.7	17.5	2.55	1.52
Communicate with peers	25.8	8.1	12.2	13.6	38.4	3.31	1.66
Browse relevant website	31.8	12.1	13.4	14.3	26.5	2.91	1.63
Process and analyze data	35.1	15.4	20.4	12.9	15.1	2.57	1.46
Solve problems	27.7	15.0	18.3	12.7	25.8	2.94	1.56
Overall pedagogical use	34.3	14.4	16.8	12.6	20.5	2.74	1.51

Std = standard deviation, Cronbach alpha = .83

Research Question 2: Students' pedagogical use of ICT in terms of school type and school location.

In terms of the differences in pedagogical use of ICT, the factorial ANOVA result shows the interaction between school type and location was statistically significant [F (2, 3374) = 9.779, p = .000, η^2 = .01].   Simple effect analysis and post hoc test (Tabachnick & Fidell, 2012) revealed that students in public urban school students (M = 2.93, SD = 1.02) significantly used ICT to support their learning more than public semi-urban (M = 2.78, SD = 1.07) and rural (M = 2.48, SD = 1.04) school students. In addition, public semi-urban school students (M = 2.78, SD = 1.07 significantly apply ICT to support their learning more than their counterparts in rural schools (M = 2.48, SD = 1.04).   Further, the results revealed that students in private urban schools (M = 2.94, SD = 1.04) significantly apply ICT to support their learning more than their counterparts in semi-urban schools (M = 2.49, SD = 1.07) and rural schools (M = 2.58, SD = 1.00). Also, students in private rural schools (M = 2.58, SD = 1.00) used ICT more than students in private semi-urban schools (M = 2.49, SD = 1.07). Further, the main effect of location was statistically significant [F (2, 3374) = 40.916, p < .01, partial η^2 = .02]. The overall column mean scores (see Table 5.12) revealed that urban school students (M = 2.93, SD = 1.03) students used ICT in their learning more than semi-urban (M = 2.64, SD = 1.07) and rural school students (M = 2.53, SD = 1.02). Finally, the overall row mean scores revealed that students (M = 2.73) in public secondary schools used ICT to support their learning more than students (M = 2.67) in private secondary schools.

Table 2. Students' Mean (pedagogical ICT use) score as Function of School Type and School Location

	Location									
	Urban			Semi-urban			Rural			
School Type	M	SD	N	M	SD	N	M	SD	N	Overall school type
Public	2.93*	1.02	658	2.78*	1. 07	716	2.48*	1.04	742	2.73
Private	2.94*	1.04	458	2.49*	1 .07	545	2.58*	1.00	261	2.67
Overall school location	2.93	1.03		2.64	1.07		2.53	1.02		

M = Mean, SD = Standard deviation, N = subsample size, *indicates significance at p < .001

Research Question 3: Relative importance of factors relating to students' pedagogical use of ICT in learning.

In terms of correlations, there was moderate relationship between students' CT usage and the variables: access to computers (Pearson Correlation Value (r) = .46, p < .01), competence (r = .44, p < .01), self-efficacy (r = .38, p < .01) and leadership support (r = .31, p < .01). Access to computers had the highest correlation with ICT use was access to computers, followed by competence. In addition, moderate relationship existed between self-efficacy and competence (r = .48, p < .01). Also, moderate correlation existed between access and competence (r = .48, p < .01). Finally, moderate correlation exited between self-efficacy and access (r = .39, p < .01). Cohen's (1988) was adopted to determine the strength of relationship. Cohen suggested that a coefficient between .30 and .49 indicates moderate correlation. In the multiple regression analysis, the variables: access to computers, competence, self-efficacy and administrative support were the predictor variables. The dependent variable was ICT usage. The results found that competence (β = .24), access (β = .23), leadership support (β = .20) and self-efficacy (β = .14) each made independent contributions to the equation predicting ICT usage. Competence was the most significant predictor, followed by access to computers. The variables correctively accounted for 32.4% of the variation in ICT.

7. Discussion

The findings of the study found that the students used ICT to communicate with peers more than any other activities. The finding of this study confirms Irfan and Noor's, (2012) study which found that students' Internet applications for communication skills are at the proficient level. Generally, this study revealed that students' use of ICT to support their learning was low. This may be attributed to students' low competence level in ICT usage. In this study, students in public schools used ICT to support their learning more than students in private schools. This result appears to be unexpected since in Ghana most private schools are better resourced than the public schools in terms of educational technology. The reason for the finding of this study could be attributed to the fact that students in public schools were only recently exposed to ICT and are therefore eager to use ICT in their learning resulting in their high usage. The finding of this study is in contradiction to Asaolu and Fashanu's, (2012) study which revealed that private schools students are more proficient in the use of ICT in their learning than their counterparts in public secondary schools. In addition, this study found that students in public and private urban schools pedagogically used ICT more than their counterparts in semi-urban and rural schools. Overall, this study revealed that students in urban schools used ICT to support their learning significantly more than students in semi-urban and rural schools. This could be attributed to greater urban schools students' access and exposure to ICT than their counterparts in semi-urban and rural schools. The finding of this study is in contradiction with Pei-Yu, (2013) who found that student preference and expectation to technology integration did not differ between rural and urban school teachers. The findings of this study found that competence, leadership support, self efficacy and access to computers significantly related to technology use of students. This result is in line with findings from previous research on computer competence (Judi, Amin, Zin & Latih, 2011), administrative support (Dexter, 2008), self-efficacy (Yuen & Ma, 2008) and access to computers (Balanskat, Blamire & Kefalla, 2007). The results of the study found that

competence was the most important predictor of students' pedagogical use of ICT. This finding is consistent with previous study which indicates that students' ICT competencies related to their successful use of ICT in learning (Shuster & Pearl, 2011).

8. Conclusion

The study found that students' pedagogical use of ICT was low. As future workers of any country, the government, school administrators and all stakeholders should provide students with the requisite knowledge and skills to be able to apply ICT in their fields of study. Disparities in technology use continue to exist among urban, semi-urban and rural school students. This finding advocates that urban school students are more exposed to ICT usage than semi-urban and rural school students. Therefore, the government, school administrators and all stakeholders should provide technology resources and training programs, particularly to semi-urban and rural school students to bridge the digital divide issue in Ghana. The findings of this study have added to the body of literature documenting the fact that digital divide continue to exist.

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