THE EFFECTS OF ICT FACILITIES ON TEACHING AND LEARNING IN SENIOR HIGH SCHOOLS IN GHANA.

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ABSTRACT

The purpose of the study was to find out the effects of ICT facilities on teaching and learning in senior high schools in Ghana. The study adopted the descriptive research design and data was analyzed using descriptive statistics and Chi square test. The findings of the research showed that all four schools under study have computer laboratories and some basic ICT tools but with limited number of computers and internet access. It was also discovered from the study that schools have ICT tools and facilities in place but are not mostly accessible to students. The study also showed that teachers seldom use ICT tools in the classroom and that the students mostly get access to ICT tools only in the ICT labs. Furthermore, the results of the study revealed the three major barriers preventing teachers from using ICT tools in the classroom: 1) limited time to use computers 2) lack of training in the usage of ICT tools and 3) ICT tools are unreliable when using it in the classroom. The study provides new and pertinent information for teachers, school management and educational policy makers for effective planning and training towards successful implementation of ICT into teaching and learning.

***Key words*:** Effects, Information and Communication Technology (ICT), ICT facilities, Teaching and Learning, Ghana.

INTRODUCTION

The rapid growth in information and communication technology (ICT) has brought remarkable changes in the twenty-first century, as well as affected the demands of modern societies (Jamieson, Proctor et al., 2006; Buabeng-Andoh, 2012; Luo & Bu, 2016; Mekki, Bajic, Chaxel, & Meyer, 2019). The way people do communicate and transact business for the past decade has drastically changed because of the advent of ICT (UNESCO, 2002 & Ismail, Khater & Zaki,2017).

ICT facilitates not only the delivery of lessons but also the learning process itself. This includes computer-based technologies, the internet, file servers, digital imaging, data storage devices, network infrastructure, desktops, laptops and broadcasting technologies namely radio and television, and telephone which are used as instructional tools at schools (Rajabion et al, 2019). Kent and Facer (2004) indicated that school is a crucial environment in which students get involved in a variety of computer activities, while the home serves as a complementary site for regular engagement in a narrower set of computer activities. Increasingly, ICT is being applied successfully in instruction, learning, and assessment. ICT is considered a mighty tool for educational change and reform. Previous research has demonstrated clearly that if ICT is used correctly it can improve educational quality and connect learning to real-life situations (Lowther, et al., 2008; Weert & Tatnall., 2005; Fu., 2013; Japhet & Usman., 2018). As Weert and Tatnall (2005) have pointed out, learning is an ongoing lifelong activity where learners change their expectations by seeking knowledge which departs from traditional approaches. As time goes by, they will have to expect and be willing to seek out new sources of knowledge. Skills in using ICT will be an indispensable prerequisite for these learners. The way digital technology has

revolutionized, the way things are done in recent times has led to the investment of millions of Ghana Cedis at both governmental and school levels for the integration of computer technology into the curriculum in pre-tertiary education. The developments and exploitation of Information and Communication Technology (ICT) in schools in Ghana has had an operational history that is just over a decade or two old. Although at the beginning, there had been several efforts at developing ICT in schools, there had not been any defined policy direction for ICT in education as to what specifically was needed to be achieved and the strategy for implementation. The use of ICT in the classroom has become important, as it provides opportunities for students to learn how to operate in an information age. Technology offers to increase access to education, thus, teaching and learning is limited less as it can occur at anywhere and anytime (Green & Donovan, 2018; Bindu, 2016). Online course materials, for example, have the potential to be accessible 24/7. Teleconferencing classrooms allow both learner and teacher to interact simultaneously with ease and convenience. In the context of ICT, learning and teaching experiences no longer depend exclusively on printed materials in terms of textbooks, worksheets, etc. A number of resources are abundant on the Internet, and knowledge can be acquired through video clips, audio sounds, visual presentation and so on.

Recent study has demonstrated that ICT helps in changing the teaching environment into a learner-centered one (Castro Sánchez and Alemán 2011 & Ellis, 2016). The learning processes in ICT classrooms are allowed by the teacher to make decisions, plans, and so forth (Lu, Hou and Huang 2010). ICT therefore provides both learners and instructors with more educational opportunities and possibilities (Díaz, García, & Cano, 2019). The development of ICT in education will result in the creation of new possibilities for learners and teachers to engage in new ways of information acquisition and analysis (Sangra & Gonzalez-Sanmamed, 2016). ICT however will enhance access

to education and improve the quality of education delivery on equitable basis. Educational systems worldwide are under increasing pressure to utilize ICT to teach students the knowledge and skills they need in the 21st century and beyond (Brahimi & Sarirete, 2015; Burakgazi et al, 2019). The problem is whether the benefits of ICT would proportionate the cost, because most developing nations are now spending a lot of the tax payer's money on ICT for teaching and learning without considering setting up criteria, standards, norm or conditions that could be used in assessing the performances of ICT in teaching and learning (Vo, Zhu, & Diep, 2017). The lack of standards for measuring performance is very problematic, hence total ignorance about performance. The use of ICT is becoming more persuasive in Ghana and the number of computers for educational purposes in the institutions is increasing. In the process, there is a proliferation of equipment standards for seemingly different goals. This situation has come about because even though government has come out with a national policy for ICT, there is the need for a well-defined policy direction in the development and exploitation of ICT in the area of education. Despite all these investments, numerous studies have revealed that students do not use ICT in their learning effectively (Woreta, Kebede & Zegeye, 2013; Sarfo & Ansong-Gyimah, 2011; Tezci, 2011; Drent & Meelissen, 2008; Tsinonis, 2018).

INTEGRATING ICT IN THE TEACHING AND LEARNING PROCESS

Worldwide, systems running education are adopting new technologies to integrate ICT in the teaching and learning process, to prepare students with the knowledge and skills they need in their subject matter (Ghavifekr & Rosdy, 2015; Turugare & Rudhumbu , 2020). In this way the teaching profession is transforming from teacher-centered to student-centered learning environment. Smeets (2005) noted that in many of the third world nations, policy and curriculum support for the

development and integration of ICT in schools have lagged behind but the situation is starting to change as researchers, academics and practitioners have worked to support the integration to enable the users to make well informed decision and choices. Therefore, there is little doubt that individual's ability to access and process information is said to become the determining factor in their integration of ICT not only into the working environment but also into their socio-cultural environment. ICT is a means which seeks to empower both students and teachers to make a meaningful contribution to education and make it more robust (Cardellino & Leiringer, 2014). This positive effect of ICT on education has placed a moral and professional commitment on the educational sector to impart sound ICT throughout the educational life of a child, not only as a subject but also as an effective learning tool with which all other subjects can be studied (Ali and Proctor, 2005). Linberg, Olofsson, and Fransson (2017) studied how Swedish secondary schools utilize ICT for teaching. Their findings showed that teachers use variety of software to teach specific subjects. There is an extensive use of learning management system which links to useful websites and lecture notes are uploaded as well as other digital learning resources. Some of the schools also use ICT for purposes of test and examination. In Pakistan, Ali and Proctor (2005) posited that the City School's management has included ICT in its curriculum and has a policy in place to introduce ICT in the classes for children with practical exercises one or two periods per week.

Sarfo and Ansong-Gyimah (2010) investigated the perceptions of students, teachers, and educational officers in Ghana on the role of computer and the teacher in promoting the first five principles of instruction. The findings of the research showed that, there are perception dissimilarities among the respondents on the role of a computer and a teacher in implementing the first five principles (task centeredness, demonstration, activation, application, and integration) of

instruction. The findings of the research showed that, there are perception dissimilarities among the respondents on the role of a computer, as well as the teacher in implementing those principles. Their research identified a mismatch of participants' recommendations on training students to acquire computer skills, and training teachers to acquire skills in designing their teaching. In a similar study, Sarfo et al., (2011), examined rural and urban students' attitudes toward ICT. In total, 324 students were selected from two senior high schools (SHSs) in Ghana to take part in the study. The results discovered that students' attitudes toward ICT were no different with regards to gender. The study established that the locality of the male and female students does not influence their attitudes toward ICT. But, students from urban schools showed more positive attitudes towards ICT than students from rural schools. However, this study was limited to only one region out of the ten regions in Ghana then.

ICT facilities used in schools focuses intensively on preparing students to acquire academic skills such as formal school works, while ICT used outside schools is dominated by entertainment such as game 14 playing, online shopping, chatting and using social networking sites (Kent and Facer, 2004; Selwyn et al., 2009). Recently, growing interest toward ICT use for informal learning outside schools has been increasing (Clark et al., 2009; Greenhow, Robelia, & Hudges, 2009; Jody et al, 2019). According to Kozma (2005), educational reforms including the integration and implementation of ICT at best, need to be systematic in nature and focus on the overall changes resulting from technology intensive interventions. Kozma (2005) is of the view that policies both local and international are important to the success of any innovations therefore policies should be provided to give a more focus vision of how technology could be used in the school and classrooms. There should be plans and programs allocated to equipment and other resources to accomplish the vision. Teachers should be provided with professional development skills in the

integration of ICT into the curriculum. Many efforts have been made to adopt ICT to elevate learning excellence in various educational settings (Cuban, 2001; Hakkarainen et al., 2000; Valentine, Marsh, Charles, & BMRB 2005). Even though teachers, school administrators and policy makers are attempting to find the better ways to use ICT to improve teaching and learning for the future, it would be difficult to pursue it without the research evidence of the impact of ICT use on teaching and learning (Bober, 2002; Barbules & Callister, 2000).

BARRIERS TO INTEGRATION OF ICT INTO TEACHING AND LEARNING

There are many factors established as hindrances to the diffusion of ICT in high schools. Pelgrum (2001) presented a list of ten of such factors that hinder ICT integration in schools. Out of the ten identified, four major ones, namely; personal ideas about the impact that technology can make to the processes of teaching and learning and classroom management; Teachers' lack of knowledge and skills; insufficient number of computers and ICT infrastructure; and difficulty in integrating ICT into teaching and learning. Mooij and Smeets (2001) explain that if teachers are not confident in their competence to handle computers, it may impede their willingness to introduce technology in their teaching. In their study, it is reported that the most relevant reason teachers give for not using ICT is that they are not familiar with ICT or they are not sure of their knowledge (Buaben-Andoh, 2019). This ICT competence factor is the same that Zhao and Cziko (2001) refer to as Control Principle. Some other crucial factors are also recorded as significantly influencing ICT use in schools. Teachers claiming to follow more innovative educational practices such as use of inquiry, project-oriented work and hands-on activities, are more likely to use new technologies than those who stick to the more traditional instructional approaches. According to Mooij and Smeets (2001) school manager's policy and budgetary decisions and in general the attitude of the

school manager (their commitment and decisions) is expected to be relevant to the ICT innovation process.

Research Questions:

1. What ICT tools are available to students?
2. What is the extent to which students use ICT tools in learning?
3. What are the challenges that hinder the successful integration of ICT into teaching and learning?

METHODOLOGY

ICT have formed an integral part of a growing range of business and other related activities after 1990 to date. This has resulted in enormous usage in computers and related technologies globally (Kagoya, 2018; Mu & Stern, 2018). It is paramount to use ICT in the teaching and learning process as a means of knowledge dissemination of information among teachers and students (Garcia-Alcaraz et al, 2019). This research was focused on both students and teacher's use of ICT tools, motivations to use and availability and accessibility for using ICT tools in the classrooms. Consequently, a semi-structured questionnaire was developed for this study.

Sample and sampling techniques

The study was conducted in 3 public and 1 private senior high school in Ghana. The target population were both teachers and students from the four schools. The schools were randomly selected from a list of all public and private senior high schools in the GA East district in Accra. The sample was heterogenous-participants were males and females and all had different computer

experience. In total, 400 questionnaires were administered to the four schools to be filled by SHS 2 students and 40 questionnaires to be filled by teachers. On average 100 questionnaires were distributed to each school for students and 10 for teachers in each school. 346 responses were retrieved from the students; therefore, the response rate was approximately 86.5%.

Research Instruments

Questionnaires were delivered in a paper format to the students. Following analysis, no outliers in the responses were identified. Reliability and validity tests were carried out to respectively determine internal consistency and ambiguity of the items.

Data collection methods

The sample of the students participating in the study were selected using a random sampling technique. The questionnaires were delivered to the students after a brief introduction and explanation of the questions. On average, students spent 15 minutes to complete the questionnaire.

Data Analysis

Analysis of data has been represented in tables while inferential statistics (Chi-square test) were used to measure the effect between variables that were studied in the population. Chi-square was used to examine the relationship between teachers use of ICT tools in teaching and the students being taught with these tools. Research questions 1 and 2 were analyzed using descriptive statistics. P-values of <0.05 were considered to be statistically significant.

RESULTS

Research question 1: What ICT tools are available and accessible to students?

All four schools have computer laboratories. All three hundred and forty-six people (N=346), 100% have computers available to them; 8.4% (N=29) have access to radio (tape recorder); 48.3% (N=167) have access to projectors; 39.3% (N=136) have access to the internet; 22.5% (N=78) have access to disc players. Table 1. shows the frequency and percentage of ICT tools available to students. Table 2 showed that all 346 (100%) of the respondents who answered 'Yes', had ICT tools available. However, as many as 210 (80.5%) of the respondents answered 'Yes' to the question; if they do use ICT tools available for their learning. Only 51(19.5%) responded 'No' to that question.

Research question 2: What is the extent to which students use ICT tools in learning

Table 3 showed the extent to which the students use ICT tools to learn in the classroom. With regards to computer usage, 132(38.2%) said they 'most often' use computers during lessons, 93 (26.9%) said they 'often' use it, 63(18%) said they 'seldom' use it whereas 58 (16.8%) answered 'not at all'. For radio (tape recorder), almost all the students 302 (87.3%) said they do not use it at all in their lessons. Only 86 (25%), 106 (31%) and 73(21%) said they 'most often', 'often', and 'seldom' use projectors respectively during their lessons whereas more than 50% said their teachers do not use the internet at all during lessons.

From Table 6, Chi-square analysis of $p < 0.05$ indicates that there was significant association between using these ICT tools (internet, projector and radio) to teach and the students being taught with these ICT tools.

Research question 3: What are the challenges that hinder the successful integration of ICT into teaching and learning?

From table 4, almost all the respondents 340 (98%) agreed that the major challenge is lack of computer literate teachers whereas, only 6 (2%) of the respondents disagreed. As many as 222 (64%) disagreed that irregular power supply hinders the use of computers in schools whereas only 124(36%) agreed. For inadequate facilities to support the application of ICT, as many as 298 (86%) of respondents agreed whereas only 48(14%) disagreed. 286 (83%) agreed and 60(17%) disagreed to the assertion that teachers are very reluctant to adopt the use of ICT tools in the teaching and learning process. 246(71%) agreed that teachers lack confidence to use ICT tools whereas 100(29%) of the respondents disagreed.

When teachers, were asked about barriers hindering the integration of ICT into teaching, it can be seen from table 5 that none responded in the affirmative that 'lack of knowledge about computers' and the 'lack of confidence' are the reasons that is preventing them from using ICT tools in their teaching. Also 25(20%) and 5(4%) of the respondents said the 'lack of training' and 'computers not accessible' respectively, are some of the factors restraining them from using ICT tools to teach. 35(27%) and 14(11%) responses respectively went to 'management don't care if I use computers or not' and the 'computer equipment is unreliable' as the inhibiting factors in using computers in the classroom. Another 18(14%) of the response went to 'no support if something goes wrong with computer'.

Table 1. ICT tools available to students (N=100)

ICT tools	frequency	percentage
Computers	346	100
Radio (tape recorder)	29	8.4
Projectors	167	48.3
Internet	136	39.3
Disc player	78	22.5

Table 2: Access to ICT tools in SHS.

Item	Yes	No	Total
Do you have access to ICT tools in the School?	346 (100%)	0 -	346 (100%)
Do you use them?	210 (80.5%)	51 (19.5%)	261 (100%)

Table 3. Extent to which students use ICT tools in learning (N=100).

ICT TOOLS	Most often		Often		Seldom		Not at all		Total	
	No	%	No	%	No	%	No	%	No	%
Computers	132	38.2	93	26.9	63	18	58	16.8	346	100
Radio (tape Recorder)	11	3.2	15	4.3	18	5.2	302	87.3	346	100
Projector	86	25	106	31	73	21	81	23	346	100
Internet	36	10.4	48	14	88	25.4	174	50.2	346	100
Disc player	11	3.2	27	7.8	35	10	273	79	346	100

Table 4. Challenges of using ICT tools in learning

Response	agree (%)	disagree (%)
My school lacks computer literate teachers	340(98%)	6(2%)
Irregular power supply hinders the use of computers	124(36%)	222(64%)
Inadequate facilities to support ICT tools	298(86%)	48(14%)
Teachers are reluctant to adopt the use of ICT	286(83%)	60(17%)
Teachers lack confidence to use ICT tools	246(71%)	100(29%)

Table 5. Teachers response to factors preventing them from using ICT tools in the classroom

Response	number	percent
Limited time to use computer	30	24
Lack of training	25	20
Computers not accessible	5	4
Management don’t care if	35	27
Computer equipment is unreliable	14	11
No support if something goes wrong with computer	18	14

Table 6. Chi-Square analysis of Teachers usage of ICT tools in teaching and the number of students who received education on the use of these ICT tools.

ICT Tools (Available)	Number of students who receive education on several of these ICT tools		X^2	P value
Internet	YES	NO		
Yes	135 (46.1%)	94(32.1%)	49.207	< 0.001
No	0 (0)	21(39.6%)		
Projector				
Yes	165(56.3%)	128(43.7%)	57.054	< 0.001
No	0(0)	53(100%)		
Radio				
Yes	27(9.2%)	266(90.8%)	5.297	0.043
No	0(0)	53(100%)		

DISCUSSION

In the present study, 346 students and 40 teachers were surveyed to analyze ICT facilities that are available, accessible and their effect on teaching and learning in the four Senior High Schools in Accra. The results show that, all four schools under study have computer laboratories and some basic ICT tools. It was discovered from the study that all the schools had ICT facilities but not all of them were accessible to students. McGrail (2005), saw ICT integrated into education, as a

catalyst for change, fostering skills in problem solving and critical thinking, as well as the development of student-centered learning.

The result of this study showed that teachers seldom use ICT tools in the classroom and that the students mostly get access to ICT tools only in the ICT labs. This limited access is consistent with the findings of Mueller et al. (2008); that, although many teachers are comfortable with technology in general, they still may not be ready or capable to integrate such technology in their classrooms. 'Seldom' and 'Not at All' use of ICT tools were more than 50 percent of the responses; therefore, this would indicate there is the need to train teachers on pedagogy in terms of how to use ICT tools. Moreover, Cox, Preston, and Cox, (1999), asserted that if teachers are to be convinced of the value in using ICT in their teaching, their training should focus on pedagogical issues.

Furthermore, factors preventing teachers from using ICT tools in the classroom, agreed with Jenson and Beauvais (2002) classification of ICT barriers: limited equipment, inadequate skills, minimal support, time constraints and lack of interest or knowledge by teachers. Also, BECTA (2004) opined that many teachers who are unskilled in ICT are not prepared to use them in the classroom or in front of students who may likely know more than them. A deduction from this is that, the three (3) major barriers preventing the use of ICT in Senior High School by teachers are the limited time to use computers, lack of training in the usage of ICT tools and finally the ICT tools are unreliable when using it in the classroom. On the other hand, two factors that respondents said in their view do not prevent them from using the ICT in the classrooms are that: ‘management don’t care if they use computers or not’ and that there is ‘no support if something goes wrong’. This means there is no comprehensive policy forcing management to inculcate the use of ICT tools in the classrooms. According to Mooij and Smeets (2001) school manager’s policy and budgetary decisions are expected to be relevant to the ICT innovation process. Also, Kirkwood, Van Der

Kuyl, Parton, and Grant (2000) suggest that teacher competence and effective ICT integration are directly related to the training of ICT and that if training is inadequate or inappropriate then teachers will not be prepared or confident to use ICT effectively in or out of the classroom.

Conclusion

The educational system in Ghana is currently bedeviled with a myriad of challenges such as: lack of adequate computers and other ICT tools especially in government Senior High Schools, lack or poor internet connectivity, and lack of coherent ICT policy framework. Even more significant is that, based on the findings of the study, majority of the teachers do not use ICT pedagogically. It is necessary that a more efficient and effective means of helping design a pedagogical innovative teaching or instructional strategies that make use of ICT tools. Based on the limitations of the research, it is suggested that further studies could be conducted by expanding the sample (teachers and students) of the present study and consider factors such as geographical location of the schools (urban verses rural).

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