

The Adoption and use of ICT in Teaching and Learning in Secondary Schools



De-Graft Johnson Dei
University of Ghana
Ghana
djdei@ug.edu.gh

ABSTRACT: *This study assess the adoption and use of ICT in teaching and learning in secondary schools in Ghana. The qualitative research method was used in this study. The research established that the ages and gender of the respondents largely affected their adoption and usage of ICT as the students, young and male teachers had more knowledge and interest in the use of ICT for teaching and learning. There was disparities in the provision of computers and ICT facilities at the secondary schools as the schools in the urban areas had some ICT facilities although they were found to be inadequate, not properly ventilated, not spacious and have poor lightening system. However, some of the teachers were having their own computers for use although they always do not use them for teaching and learning. As a result, the impact of ICT in teaching and learning at the secondary schools were minimal.*

Key words: Information and Communication Technology, Computers, Teaching, Learning, Schools

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1. Background to the Study

Today, the educational sector of Ghana is confronted with series of changes and reforms. Numerous strategies for teaching and learning have been developed which correspond to the accommodation of students' need and diverse learning method. One of such strategy involves the use of information and communication technology (ICT). ICT has become a force that has changed many aspects of the way we live and every aspect of human endeavor (Quarshie, 2015). Therefore, its integration into the classroom will significantly improve the educational experience.

ICT is the use of technology in managing and processing information with the use of electronic computer system and computer software to convert, store, protect, process, transmit and retrieve information. Oje (2005) states that awareness towards the use of ICT is increasing in the classroom in the developing world such that mere verbalization or over verbalization of words alone to communicate ideas, skills and attitude to educate learners is futile.

ICT has now become an integral part of teaching and learning in schools. It provides opportunities for both teachers and students to learn how to operate in an information and technology age. ICTs are drastically changing schools' syllabus in a number of ways, demanding that teachers focus on new teaching methodologies instead of relying on traditional methodologies. As Hare (2007) puts it, the successful integration of technology in education is not simple, because it depends on such interlinking variables.

The development of ICT itself dictates that in order for teachers and students to adjust to modern society and the global economy, the way in which teachers teach and students what to be taught requires modifications to and around ICT (Watson, 2001). However, Oje (2005) and Hare (2007) argue that although educators appear to acknowledge the value of ICT, difficulties continue to be encountered in adopting and integrating such technologies. Kok (2007), also express that though many teachers are comfortable with the emergence of technology in general, they still cannot be ready or capable to integrate these technology into their classrooms.

Kok (2007) noted that the problem of information technology illiteracy was a serious one among. That is, many teachers did not have basic computer appreciation skills and noted that the problem was a hindrance to efforts at achieving the use of computers for educational purposes in schools. Same conditions can be said of Ghana as established by Quarshie (2015). In Ghana, the state of ICT facilities, and the lack of adequate ICT text books affect effective teaching and learning. If teachers and students in senior secondary schools are exposed to ICT usage in classroom teachings, how would it bring about an impact in teaching and learning. It is against this background that the study seeks to assess the role of ICT in secondary school education in Ghana.

2. Literature Review

2.1 The Concept of ICT and its impact on Teaching and Learning

According to IMPICT (2012), ICT is the process of gathering, creating, processing, and storage of information by using hardware, software, as well as the internet and global system of mobile communication (GSM). However, the communication aspect of ICT is assuming more significance now than ever before, hence, it is now more appropriate to use the expression ICT rather than mere information technology which has become the back bone of the new information based global economy (Quarshie, 2015).

Today, development has brought about evaluation of ICT, which is ever growing and continuously affecting every aspect of human endeavour (Abifarina, 2003). Thus, the teacher using ICT in the class will be able to present a well-planned set of lessons and the students will experience these lessons in an exciting environment. Ojo (2005) notes that the misconception that the computer will replace the teacher and thus render them redundant does not arise; all the computer does is to reinforce and enhance the teacher's lessons. ICT can help students to become independent learners capable of developing critical thinking and problems-solving strategies, collaborative works and inquiry. It allows for information searches, computer modelling, team-work, brain-storming and revision. Teachers can use computers to make learning experiences more effective and to offer students access to a variety of learning tools, expert opinions and alternative viewpoints (Quarshie, 2015).

Idahosa and Ero (2005) states that in computer assisted instruction; lessons production is guided by the learners' knowledge, skills, understanding, expectations as well as motivation. This implies that a computer is not an instructor in itself but rather a mere vehicle of instruction. It is a clear secret that the computer offers powerful features for facilitating learning. Utor and Agbi (2006) identifies telecommunication and teleconferencing as another useful development in ICT where students can sit in their respective classrooms or research centres and partake in teaching without necessarily visiting each other.

ICT play a critical role in socio-economic development because they are being used to achieve sustainable development (Quarshie, 2015). That is, ICT sustains development by enhancing the following:

- Improvement of institution information management, inter-institutional communication, communication between regional or state cooperation institutions and their organizations thereby facilitate integration.
- Promote trade, financial cooperation, agricultural development, educational research, environmental protection etc.
- ICT could also catalyse trans-border data flows bringing down barriers to personal communications and removing the constraints of national boundaries, physical disabilities as well as distance. By providing access to network, ICT reduces the

costs of international communication among countries.

2.3 Policy on ICT Education in Ghana

The government of Ghana has committed to the transformation of the agro-based economy into an economy driven by ICT that generates an information and knowledge – based economy. The government of Ghana has acknowledged the need for ICT training and education in the schools and the improvement of the education system as a whole. The development of ICT into education will result in the creation of new possibilities for learners and teachers to engage in new ways of information acquisition and analysis; ICT will enhance access to Education and improve the quality of education delivery on equitable basis.

Again, the government of Ghana has developed comprehensive programs that aims at the utilization of ICT within the education sector. This will help to transform the educational system and thereby improve the lives of Ghanaians. Through the implementation and utilisation of ICT in education, the culture and practice of traditional memory-based learning will be transformed to education that stimulates thinking and creativity necessary to meet the challenges of the twenty first Century (Ministry of Education, 2008)

The fundamental objective of the policy is to ensure that the Ghanaian education sector provides adequate opportunities for Ghanaians to develop the necessary skills, regardless of the levels of education (formal and non-formal), to benefit fully from the Information Society (Ministry of Education, 2008). The policy goals include the following:

1. Facilitating the deployment, utilization and exploitation within the educational system to improve on educational access and delivery to support teaching and learning from the primary level upwards
2. Modernize the educational system to improve the quality of education and training at all levels of the educational system and expanding access to education, training and research resources and facilities.
3. To orient all levels of the country's educational system to the teaching and learning of science and technology in order to accelerate the acculturation of science and technology in society and produce a critical mass of requites human resources and a well-informed citizenry.
4. To achieve universal basic education and improve the level of basic and computer literacy in the country.
5. To ensure a population in which all citizens are at least functionally literate and productive.
6. To expand and increase access to secondary and tertiary education.
7. To strengthen science education at all levels and in all aspects of the educational system, especially at the basic and secondary levels.

The efforts to introduce ICTs into the sector by the Ministry (primarily through the GES), its development partners and other private sector agencies cover over ten (10) years. Initiatives have spanned pre-tertiary (both public and private schools) and tertiary. Efforts have largely been geared towards the deployment of ICTs to these facilities via the provision of computers and the establishment of ICT laboratories. Access however is still below the standards and numbers demanded.

Additionally, there have been several private sector initiatives to set up Community based ICT centers. These however have been largely confined to urban areas with few available examples of how they have been used to support educational objectives. In a study carried out to review and assess the ICT in Education Initiatives in Ghana (2005), twenty initiatives were selected and their impact assessed to see what lessons could be learnt. Several positive achievements were noted.

- Initiatives contributed to a wider number of students and teachers acquiring ICT skills and developing strong interests in ICT and Science;
- Schools involved in the initiatives were motivated to expand the project and/or acquire more ICT equipment; a number of private-public partners, including Parent Teachers Associations (PTAs) and civil society collaborated in the efforts;
- Lessons learnt from initiatives provided good examples for other schools to introduce their own ICT programs;

However, the projects themselves faced a number of challenges. At least half of the initiatives had been launched as pilots with none expanded into national initiatives. Implementation challenges include:

- Poor selection of schools without the involvement of GES / MOE resulting in duplication and hence some schools having several parallel initiatives while others (especially those in the remote rural towns) had none.
- Lack of policy direction at all levels (schools, districts, national) for the integration of ICT in education;
- Heavy dependency on external funds, with most initiatives stopped after depletion of initial funding
- Dumping' of obsolete and inappropriate equipment as support' for the initiatives
- Low levels of ownership at the level of the schools, due to external motivations, and low levels of understanding on the part of recipients about the potentials of ICTs in education
- Lack of trained ICT personnel (including teachers) far below the numbers demanded to support the initiatives with most capacity building efforts one-off with no continuous trainings planned for

Additionally, there was the recognition that to ensure success and sustainability, ICT in Education projects should be implemented not necessarily to increase the number of computers, but should instead be based on supporting discrete educational objectives. The lessons learned from the initiatives further highlighted the need for a coordinated, focused and properly managed approach to the adoption and utilization of ICTs. Such an approach could further improve the accessibility and delivery of quality education and better maximize the impact of ICTs in Education.

3. Methodology

This study used the exploratory research as a means of finding out the role of ICT in senior secondary school education in Ghana. This enabled the researcher to seek new insight, ask questions and assess phenomena in a new light. The use of exploratory research in this study involved the review of relevant literature in the field of ICT in education. Furthermore, the qualitative research method was applied in this research. The qualitative research enabled the researcher to uncover issues in order to generate new ideas. The use of the qualitative approach enabled the researcher achieve an in-depth understanding of the role of ICT in senior secondary school education in Ghana by explaining the phenomena rather than to measure.

The study focused on the 10 secondary schools in the southern sector of Ghana (Western, Central, Greater Accra, Volta and Eastern Regions). Two secondary schools were purposively selected from each region. From each secondary school, the researcher used the stratified sampling technique to divide the population into two strata, which consisted of teachers (strata 1) and students (strata 2). Again, from each secondary school, four (4) teachers and four (4) students were selected at random to serve as the respondents for this study. Therefore, a total of 80 respondents (40 teachers and 40 students) participated in this research.

Data was collected from both primary and secondary sources. Primary data was collected with the use of observation and questionnaires (consisting of both closed and open-ended questions). The use of observation allowed the researcher to experience the actual use of ICT and the availability of infrastructure at the secondary schools. Secondary data was collected from libraries, websites, databases and journals. Data analysis went through two main stages. The first stage was the data preparation which involved organizing, piling up, typing field-notes and recordings, and sorting the data. The second component was the analysis itself where the researcher analyzed the data by coding the refined (prepared) data and made it ready for analysis. The SPSS was employed at this stage of the analysis.

4. Results and Discussion

In assessing the adoption and use of ICT in teaching and learning in secondary schools in Ghana, and in line with the methodology set for this study, the researcher presents a summarized findings in the table below. The descriptive analysis of the findings is also presented after the table.

According to Boondao (2013: 23), there exist certain effects of the personal factors of gender, age, position, and level of education on managing knowledge in organisations though they may not be statistically significant. The researcher observed that the ages and gender of the respondents largely affected their adoption and usage of ICT. That is, the majority of the males and younger teachers show better skills and appreciation especially in purely technical issues if the ICT. They were more curious and interested in the usage and application ICT in teaching and learning. On the other hand, the female and older

Adoption and use of ICT in teaching and learning		Teachers		Students		Net	
		Responses	%	Responses	%	Responses	%
Gender	Male	14	35	21	52.50	35	43.75
	Female	26	65	19	47.50	45	56.25
Age	Below 20	1	2.50	38	95	39	48.75
	21-30	11	27.50	2	5	13	16.25
	31-40	16	40	0	0	16	20
	Above 40	12	30	0	0	12	15
Knowledge in Computers	Good	12	30	20	50	32	40
	Average	15	37.50	14	35	29	36.25
	Below Average	11	27.50	5	12.25	16	20
	No Knowledge	2	5	1	2.50	3	3.75
Training in the use of Computers	Yes	14	35	17	42.50	31	38.75
	No	26	65	23	57.50	49	61.25
Frequency of usage of Computers	Everyday	8	20	5	12.50	13	16.25
	3 Times a Week	9	22.50	13	32.50	22	27.50
	One's a Week	9	22.50	9	22.50	18	22.50
	Ones in 2 Weeks	7	17.50	4	10	11	13.75
	One's a month	4	10	6	15	10	12.5
	Never	3	7.54	3	7.50	6	7.50
Availability of Computer Lab	Available	24	60	24	60	48	60
	Not Available	16	40	16	40	32	40
Adequacy of Computer	Adequate	13	32.50	11	27.50	24	30
	Inadequate	27	67.50	29	72.50	56	70
Condition or state of Computers	Very Good	1	2.50	1	2.50	2	2.50
	Good	11	27.50	8	20	19	23.75
	Bad	12	30	8	20	20	25
	Extremely Bad	16	40	23	57.50	39	48.75
Owning Personal Computers/Laptops	Yes	18	45	N/A	N/A	18	45
	No	22	55	N/A	N/A	22	55
Availability of Internet	Available	4	10	5	12.50	9	11.25
	Not Available	36	90	35	87.50	71	88.75

Usage of Computers for Teaching and Learning	Yes	16	40	9	22.50	25	31.25
	No	24	60	31	77.50	55	68.75
How does the usage of computers affect Teaching and Learning	Positive	13	56.52	15	37.50	28	44.45
	Normal	3	13.04	14	35	17	26.98
	Negative	7	30.44	11	27.50	18	28.57

Source: Field data January, 2018

Table 1. Adoption and use of ICT in teaching and learning in secondary schools

teachers showed less interest in the usage and application of ICT in education. This was evidenced during the observation and interaction processes at the secondary schools. In addition, the students were more exposed to and appreciated the use of ICT to facilitate teaching and learning than the teachers. Majority (75%) of the student respondents showed much knowledge in the usage and application of ICT in education.

Using computer is requires some basic training and skill (Ahiatrogah & Adane, 2011). This was not the case in this study as it was established that majority of the respondents (61.25%) had no formal training in the use of ICTs. The same respondents said they were prepared to acquire more knowledge and skills on the new and modern technologies relevant to teaching and delivery of their core mandate. However, 3.75% said they had no knowledge at all in the usage of computers or ICT both for instruction and learning. Knezek and Christensen (2002), Walker (2005) and Munyantware (2006) state that educators with higher levels of ICT skill, knowledge, and tools exhibited higher levels of technology integration in the classroom and teachers with lower technology proficiency are usually not willing and have less confidence to use ICT for teaching.

With regards to infrastructure, the study established that there were disparities in the provision of computers and ICT infrastructure at the schools. The study established that out of the 10 secondary schools visited, 6 (60%) had computer laboratories while 4 (40%) were not having computer laboratories. The researcher observed that while the schools with the computer laboratories were mainly at the urban areas (metropolis) while those without computer laboratories were found in the rural areas. In addition, the researcher observed that the respondents who indicated that they have never used the computers both for teaching and learning were from the secondary schools where there are no computer laboratories. Ukpebor (2006) states that computer laboratories should contain instructional materials and equipment to facilitate learning or acts as resources centres for teaching and learning and provides both teachers and students with experiences that are needed in order to acquire the concept/principles.

With regard to the adequacy, condition and state of the computers and the computer laboratories, the study established that even at the secondary schools with computer laboratories, the computers were inadequate (30% adequate; 70% inadequate) and not in good condition (2.50% in very good condition, 23.75% good condition, 25% bad, and 48.75% extremely bad). The researcher observed that most of the computers at the computer laboratories had broken down and not functioning. Furthermore, it was revealed that most of the computer laboratories were not properly ventilated as only three (3) of the computer laboratories have functioning air-conditions with the rest using fans. In addition the computer laboratories were not spacious enough coupled and have poor lightening system.

Another finding was that some of the teachers (32.15%) were having their own PCs (personal computers, laptops or tablets) for use. The respondents again said they will prefer using their personal laptops and tablets for research and information retrieval purposes since they hardly use the ones at the laboratories or rarely have access to computers at the computer laboratories.

For those without PCs, due to the fact that the computers are not adequate for the students to use, they (the teachers) who were willing to use the computers for their personal practice could hardly get the chance as the computers in the laboratories are always under intense pressure for use by the students as it has been designed on the schools timetable. As a result, they sometimes have to depend on their colleagues (teachers) to lend them their PCs when they are in need to them.

Internet connectivity at the secondary schools was very bad as only 11.25% indicated that they have internet connectivity in the computer laboratory. The report from the observation also corresponds to the responses of the obtained from the questionnaire. This means, out of the 10 selected secondary schools, only one (1) had internet connectivity at the computer laboratory which is a very bad signal. However, some the respondents indicated that they have their personal Modem and MiFi internet facilities for use.

The response further shows that majority of the teachers (60%) and students (77.50%) do not use the computers for teaching and learning. This result could be attributed to the absence of computer laboratories in some of the schools and the poor state of the computers and computer laboratories in the schools with computer laboratories. In relation to the factors that promote the usage ICTs in the schools, the following were identified:

1. Computer
2. Projector
3. Computer laboratory
4. Electronic library databases
5. Internet
6. Mobile phones

The usage of computers affect teaching and learning (McCoy, 2017). In relation to this, the study established that while 44.45% (teachers, 56.52%; students, 37.50%) of the respondents believed the usage of computers had positive affect teaching and learning, 22.98% think the impact was normal while 28.57% believed the usage of computers had negative affect teaching and learning. According to Osiakwan (2002), to a larger extent, ICTs are major tools for sustaining development and this is evident in the numerous benefits of computers in teaching and learning outlined by the respondents'. The respondents again outlined the benefits of computers in teaching and learning in the secondary schools as follows:

1. Students learn best by practicing (hands-on-usage), and using computers in instruction they take active involvement and participation in the teaching and learning process.
2. Some computer applications (software/programs) are interactive and they give the users the opportunity participate in the form of questions and answers (Q&A). This improves teaching and learning.
3. Using computer projectors and slides (audio-visual elements) to facilitate teaching and learning is more appealing, interactive and attracts the attention of the students
4. Computers brings out a wealth of instructional resources (materials) into the class room via the internet.
5. Both the teachers and students can access relevant learning materials (information) on the internet
6. The use of computers in the classroom can help to engage students in problem solving which can lead to a deeper understanding

In relation to the factors that inhibit the usage of ICTs in teaching and learning, it was found out that there were so many factors. The factors identified are mainly cost, technology, skills, managerial and leadership, and environmental related. Below are the main factors that were identified:

The responses obtained from the responded as outline in Table 2 showed that the factors are mainly cost, technology, skills, managerial and leadership, and environmentally related. The cost element relates to ICT training materials and ICT infrastructure deployment and implementation. This finding is confirmed by Lyamu (2005) and Sharma (2003) that the higher the cost of computers and their accessories, the fewer computers one can buy with the limited resources. Therefore, to increase accessibility to ICT tools, stakeholders in academic institutions need appropriate information related to costs of computers so that alternative means of acquiring cheap peripherals can be sought.

While the cost was identified, the unavailability and limitation of the technology also impeded the deployment and use of ICT in the secondary schools. This could largely be attributed to limited money (funds) to finance or acquire the ICT infrastructure and deployment, and hiring the right personnel to manage the ICTs at the secondary schools. Aryatuha (2007) reported that cost

Learning Cost related factors	
1	The cost of acquiring the computers and their peripheral devices, installation and maintenance.
2	The cost of acquiring ICT materials and textbooks for use in teaching and instruction purposes
3	The high cost of the hardware and software applications which leads to low integration of ICT in learning and teaching
4	The cost of internet bundle and access to internet
5	The cost of training and acquiring skills and knowledge in the use of computers and applications
Technological related factors	
6	Inadequate and Lack of computers to aid teaching and learning
7	No computer laboratories for teaching, demonstration and learning
8	The small and limited computers available are outmoded and obsolete
9	There is no internet connectivity in the computer laboratories
10	Limited or poor internet connectivity in the schools with internet connectivity
11	Lack of supporting devices such as projectors, scanners, printers, photocopiers among others to aid the teaching and actual use/demonstration.
12	Lack of periodical maintenance of the computers and their peripheral devices at the computer laboratories and the offices
Skills related factors	
13	Lack of skills and competencies to handle the computers and their peripheral devices
14	Lack of knowledge and appreciation for the use of the systems
15	Fear to use ICT in teaching and learning due to limited knowledge
16	Lack of confidence in the use of computers
17	Lack of training and skills development on the use and adoption of ICT for teaching and learning at the schools
18	Due to lack of motivation, very few teachers are using computers in teaching and
Management and Leadership related factors	
19	Inadequate support from the government, ministry of education, and other agencies on the acquisition and implementation of ICT in the secondary schools
20	Lack of adequate support from the heads (headmasters/headmistresses) of the schools towards ICT training, adoption and implementation in the form of finance, technical and managerial
21	The heads (headmasters/headmistresses) do not appreciate the role and impact on the deployment and adoption of use of ICT in teaching and learning at the schools
22	Failure to integrate ICT and computers into the core curriculum of the schools
Environmental related factors	
23	Lack of space in the computer laboratories
24	Poor ventilation in the computer laboratories
25	Due to the absence of air-conditions in the computer laboratories, dust easily and often enters the computer laboratory.

Source: Field data January, 2018

Table 2. Factors that inhibit the usage of ICTS in teaching and learning

of ICT tools would not be considered a problem if African economies were not poor and thus lack resources.

In respect to skills development in ICT and ICT implementation, there was a significant relationship between skills acquisition in ICT and usage or adoption at the schools. In addition, the lack of motivation and supports from the leadership and management of the schools directly affected the deployment and adoption of ICTs in the schools. Due to this, there is need for the schools to collaborate with the Ministry of Education and other agencies to put in place program to help teachers incorporate ICT in their teaching process. As such Kariuki (2004) stated that educators who received constructive support from administrators were more likely to use technologies in their teaching practice while those who received poor support or encouragement from higher authorities in school were less enthusiastic in using computer or did not integrate technology at all.

5. Conclusion

This study investigated the adoption and use of ICT on teaching and learning in secondary schools in Ghana. The researcher observed that the ages and gender of the respondents largely affected their adoption and usage of ICT as the students, young and male teachers had more knowledge and interest in the use of computers for teaching and learning. There was disparities in the provision of computers and ICT facilities at the secondary schools as the schools in the urban areas had some ICT facilities although they were found to be inadequate, not properly ventilated, not spacious enough and have poor lightening system. However, some of the teachers were having their own PCs (personal computers, laptops or tablets) for use although they always do not use them for teaching and learning. As a result, the impact of ICT in teaching and learning at the secondary schools were minimal.

Based on this it is recommended that 11

1. ICT infrastructure (computer lab and internet) should be provided at the schools for effective teaching and learning process since it is the basic stage of equipping the youth with the necessary skills and knowledge for national development.
2. There should be an assessment of the computers in the schools to determine which ones need to be repaired and which ones need to be replaced.
3. Teachers should be given more and necessary training in ICT usage so that they become familiar with modern pedagogy of imparting knowledge and skills, and possible become part of curriculum structure for their professional training.

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