Students' Perception of ICTs on Teaching and Learning at Wurishei Community Al-Badah Junior High School, Tamale, Ghana

Imoro Pars Naaba Hajara[1] and Musah Bukari[2*]

[1]*Department of Administration, M-bukCONCEPTS, Tamale, Ghana.*
[2]*Department of Industrial Art, Tamale Technical University, Ghana.*

Authors' contributions

This work was carried out in collaboration between both authors. Author MB designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author IPNH managed the literature searches and analyses of the study. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Learning, which is a step-by-step process in which an individual experiences permanent, lasting changes in knowledge, behaviors or ways of processing the world, is an area in which Information and Communication Technology (ICT) can have significant influence. This study principally identified and established Students' Perception of ICTs on Teaching and Learning at Wurishei Community Al-Badah Junior High School. The study employed simple random sampling technique in selecting a sample size of 45 out of 150 students. Structured and semi- structured questionnaire were used to collect primary data from respondents. The primary data of the study was analyzed using Excel. The study identified Computer, Phone, CD/DVD Player, Television, Printer and Modem as the common ICTs facilities available for use by students for learning. Factors identified as militating against the use of ICTs by students included limited duration of ICT lessons as well as teachers' inability to cater for individual learning needs during classes. Students who used ICTs for learning perceived it to be very interactive, more fun and motivating. In conclusion, the study

_____

Corresponding author: E-mail: musahyooco@yahoo.com;

recommended that the teachers should incorporate more TLMs into the lessons to make it more interactive for students. To modernize the educational system is the right way to improve the quality of our educational system through ICT use and that both strong and weak students benefit from ICT use. ICT use has positive effects on behavior, communication and process skills.

Keywords: ICTs; perception; students; teaching and learning; Ghana.

1. INTRODUCTION

In 2003, the Government of Ghana, through the National Information and Communication Technology (ICT) Policy and Plan Development Committee formulated an ICT Policy for Accelerated development (ICT4AD), which was ratified and adopted in January, 2004. This policy is the foundation upon which Ghana's vision for the information age has been built [1]. The Government of Ghana is committed to pursuing an ICT for Accelerated Development (ICT4AD) aimed at improving the quality of life of the people of Ghana by significantly enriching their social, economic and cultural well-being through the rapid development and modernization of the economy and society using information and communication technologies as the main engine for accelerated and sustainable economic and social development [1]. Quite apart from that, the government is committed to pursuing a number of key strategies towards the achievement of its vision. Key among them are to:

- Transform Ghana into an information and knowledge-driven ICT literate nation;
- Modernize Ghana's Educational System using ICTs to improve and expand access to educational training and research resource and facilities; improve the quality of education and training and make the educational system responsive to the needs and requirements of the economy and society with specific reference to the development of the information and knowledge-based economy;
- Promote basic training in ICTs in all schools and tertiary institutions [1].

In line with the ICT for Accelerated Development Strategy policy, the Ministry of Education's (MoE's) ICT Policy seeks to achieve the broad objective of transforming the educational system to provide the requisite educational and training services, and an environment capable of producing the right types of skills and human resources required for development and driving Ghana's information and knowledge-based economy and society [1]. Specifically, the policy

seeks to achieve among others the following objectives:

- To facilitate the development of ICTs within educational system to improve on educational access and delivery and to support teaching and learning from primary school upwards; the quality of education and training at all levels of the education system and expanding access to educational training and research resources and facilities;
- To modernize the educational system to improve the quality of educational system;
- To achieve universal basic education and improve the level of basic and computer literacy in the country [1].

In pursuance of its ICT for Accelerated Development Policy, the Government of Ghana has made massive investment in ICT infrastructure such as the development of the national fiber-optic network called VOLTACOM project by the nation power hub, the Volta River Authority [2]. Successive governments over the years have also provided schools and colleges with ICT facilities such as the provision of computers and the development of computer laboratories. The Government of Ghana and other agencies, including the Abdul Salam International Center for Theatrical Physics and Kofi Annan Information Technology Center, have trained over thousands of professionals (including teachers) in ICT and related area to provide the necessary knowledge and skills to support ICT activities in the country [3]. The Government of Ghana is currently embarking on the provision of "Better Ghana Agenda" laptops to pupils, schools and colleges. For a developing country such as Ghana to invest in ICTs presents the dilemma of spending scarce/valuable resources on ICTs or consequently suffering from widening technological gap [4]. As noted by [4], revealed that, ICTs can be powerful and essential tools for teaching and learning, understanding, interpreting and communication about the real world or they can be black holes into which we pour our money, intelligence and time, getting very little in return. It is based on

these concerns that necessitated the study of students' perception of ICTs on teaching and learning at Wurishei Community Al-Badah Junior High School.

1.1 Perceived Problem

The Ghana Government has been investing in the integration of ICTs in education for the past decade. Efforts have largely been geared towards the deployment of ICTs to school and colleges such as the provision of computers, establishment of ICT laboratories, and human resource capacity building [4]. However, little is known about students' perception of ICTs on Teaching and Learning. Despite these institutional policies and the huge investment government and its agencies have made in ICT in teaching and learning, its perceived influence on students' of Wurishei Community Al-Badah Junior High School in teaching and learning is not documented. This study therefore seeks to find out the perceived influence of ICTs on students' of Wurishei Community Al-Badah Junior High School (JHS) in the Sagnarigu District of the Northern Region.

1.2 Problem Diagnosis

It has been discovered in recent years that ICTs are being canvassed by several people as being effective in improving teaching and learning. In the present information age, the issue of students' use of ICT is of crucial importance. The use of ICTs by students would enhance competence and confidence in them and also widen their learning capabilities. However, many students at Wurishei Community Al-Badah Junior High School still patronize traditional book materials as a source of information in our schools rather than ICT that is more efficient and reliable; for this reason, the need for the study.

1.3 Evidence of the Problem

As part of the course work, preliminary studies were conducted during the researchers' teaching practice and this revealed that students had no idea of what ICTs were and its influence on teaching and learning in the school. Students had some ICT tools but did not know the benefits that could be derived from using them in learning. Hence, the need to examine students' perception of ICTs on teaching and learning at Wurishei Community Al-Badah Junior High School.

1.4 Causes of the Problem

In an attempt to examine students' perception of ICTs on teaching and learning at Wurishei Community Al-Badah Junior High School, it was discovered that most of the ICT teachers were not fully equipped with the relevant ICT tools and knowledge to be able to impact on students. Most of the lessons taught were abstract and confusing. Students who complained were directed to private ICT centres to learn on their own cost.

1.5 Purpose of the Study

The main purpose of the study was to examine Students' Perception of ICTs on Teaching and Learning at Wurishei Community Al-Badah Junior High School, Sagnarigu District, Northern Region.

1.6 Objectives of the Study

The study seeks to:

- Identify the ICTs that are available to students for teaching and learning at Wurishei Community Al-Badah Junior High School;
- Determine Students' Perception of ICTs on teaching and learning at Wurishei Community Al-Badah Junior High School.

1.7 Research Questions

In order to achieve the purpose of the study, the following research questions were formulated:

- What ICT facilities are available to students for teaching and learning at Wurishei Community Al-Badah Junior High School?
- What are the perceived influences of ICTs on teaching and learning of students at Wurishei Community Al-Badah Junior High School?

2. LITERATURE REVIEW

2.1 The Concept of Information and Communication Technology (ICT)

The concept of ICT has been variously defined ranging from general to specific applications. [5] defined ICT as a computer-based tool used by people to work with information and information-

processing needs of organization. This definition is general and broad-based and applicable to different organization including educational institution. [6] defined ICT as;

> *"Basically information-handling tools- a varied set of goods, application and services that are used to produce, store, process, distribute and exchange information. They include the 'old' ICTs of radio, television and telephone, and the 'new' ICTS of computers, satellite, wireless technology and the internet. These different tools are now able to work together, and combine to form our 'networked world' – a massive infrastructure of interconnected telephone service standardized computing hardware, the internet, radio and television, which reaches into every corner of the globe".*

Reddi's definition establishes a dichotomy of the old and the new ICTs and puts much emphasis on the hardware aspects of ICT with very little or no mention of the application system used to do the transaction on the facilities mentioned. This definition is broad-based but does not capture central theme of this essay-ICT for teaching and learning. In the light of the above discussion, ICT is defined as the hardware and software including both the analogue and digital media that can be used for teaching and learning. In order to appreciate what is meant by ICT in education, it is important that we know the origin of ICT and what it really is. Research has it that the use of computers became popular in the 1980's when personal computers became available to consumers. Again research has shown that it is this global competition that has influenced governmental policies all over the world in ensuring that they keep pace with these technological advancements. These policies motivated the mass production of computers for schools. Several researchers suggested that ICT will be an important part of the education process for the next generation. According to [7], history has it that towards the end of the 1980's, the term 'information technology' began to replace the word 'computer'. The term information technology therefore referred to computer's processing ability, indicating a shift from computing technology to the capacity to store and retrieve information. [7] again posited that the term ICT emerged signaling the introduction of email and electronic messaging with computer technology. Simply put ICT is an accepted acronym of the word information and communication technology. It is a diverse set of

technological tools and resources used to communicate and to create, disseminate, store and manage information. This means that ICT helps in the storage and management of information. Also, ICT is defined as the use of computer systems and telecommunications equipment in information processing. Finally, ICT as described by Pelgrum and Law encompasses a range of applications, communications and technologies which aid information retrieval and research communication and administration. These include: Internet access, electronic mail, CD-ROMS, telephone, online databases, library services and fax machines. The emerging phenomenon was welcomed in the 1980's that educational systems needed to prepare students to adjust to and survive in this new technologically driven society. This meant preparing students for "lifelong leaning in an information society" [7]. Allied to this, early advocates of ICT integrated education saw it as a catalyst for change, fostering skills in problem solving and critical thinking, as well as the development of student-centred learning. According to [8], there are three rationales for the introduction of ICT into education. The first one is the economic rationale which refers to the role it can play in preparing students as future workers and in supporting economic development. The second is the social rationale where ICT investment aims to: increase knowledge sharing, encourage cultural creativity, increase civic participation, make government services more accessible and finally enhance social cohesion. The third and final rationale is the educational and pedagogic rationale where ICT can advance educational reform and improve educational management structures. Similarly, [9] broadly concur, identifying three reasons for the use of ICT in education: the development of new skills for the information age, increased productivity and the development of quality learning. Whereas [8] posits that there are three rationales for the introduction of ICT into education, [9] proposes four rationales for the utilization of computers in schools. He notes these as social, vocational, pedagogical and catalytical. The social and vocational rationales point to the increased use of ICT in all spheres of human activity. The pedagogical and catalytically rationales relate to the effects of technology on students and schools. According to [10] arguments for using computers in schools, stem from technological and socially determined points of view. His standpoint is that the school systems within which the computer is used, are driven by computers. He argues that a change occurs

within the education system using the computer and that change is as a result of the effect of technology. [10] argues that the social context sees computers as neutral technology-technical means of achieving a defined purpose in education. Two contexts emerge and are used in this study. The social context and the pedagogical context. The social context runs along the lines of Hawkridge's social and vocational rationales, whiles the pedagogical context agrees with Hawkridge's pedagogical and catalytical rationales. The pedagogical context also agrees with the views of [10]. [11], identify three objectives for the integration of ICT in education. They are: the use of ICT as a 'discipline or profession'; ICT as a 'teaching or learning medium' and the use of ICT as an 'object of study'. It can be gleaned from these objectives that integration involves aiding the teaching and learning process (apart from the third objective which is a discipline in itself). Successful integration of ICT in education can lead to a number of benefits.

2.2 The Influence of ICT on Students

In recent years, a number of impact studies have been conducted with the expressed aim of assessing the return on investment of ICT in education. [12] conducted a review of seventeen such impact studies carried out in Europe between 2002 and 2006 and aimed at determining the benefits and impact of ICT integration in schools in two major areas: learning outcomes and learners and teaching methodologies and teachers. Six of the studies reviewed were quantitative in nature while the others followed a qualitative orientation. The quantitative studies attempted to establish causal links between ICT use and learning outcomes. Though the studies revealed some evidence that ICT impacts on learner performance, the general conclusion was that it was difficult to establish a causal relation between computers and educational outcomes [12]. The findings of these studies led to the conclusion that ICT impacts on educational standards most when there is fertile ground in schools for making efficient use of it. The qualitative studies revealed that teachers, students and, significantly, parents believe that ICT use has a positive impact on students" learning and that students" subject-related performance improves with ICT use. The findings also indicate that teachers believe that the educational achievements of students improve through ICT use and that both strong and weak students benefit from ICT use. Teachers

observed that when ICT is used in the classroom pupils work more in cohesion with their own learning styles resulting in a more favorable impact on both academically strong and weak students. In addition, students assume greater responsibility for their own learning, working more independently and effectively when using ICT. All the studies concluded that the integration of ICT has the greatest impact in the affective domain. The studies revealed that 86% of teachers in Europe reported that students are more motivated, engaged and attentive when computers and the Internet are used in the classroom and that ICT use has positive effects on behavior, communication and process skills. These conclusions are corroborated by the findings of a three-year study of New Zealand's e-learning initiative conducted by [13] between 2001 and 2004. The study aimed at investigating teachers' perceptions of the teaching and learning effects of ICT use in 26 secondary schools. For the purpose of the study both quantitative and qualitative data were collected. The study concluded that the integration of ICT in educational practice had a number of positive social and motivational effects on the learners including increased interest and engagement and that the social and motivational effects were more frequently observed than cognitive and learning effects. Teachers reported an improvement in the presentation of work, an increased sharing of resources, greater collaboration between students and an increased motivation for learning as student engagement was greater. However, the study also revealed a number of negative consequences such as increased plagiarism and a higher level of distraction. [14] reported on the findings of the *InterActive Education Project* conducted in the United Kingdom in which teachers and researchers worked together to develop and evaluate initiatives focused on using ICT to enhance learning in curriculum areas that students would normally find difficult. The study was conducted over a two year period and involved 54 teachers from both primary and secondary schools. The project was predicated on the view that ICT in itself does not enhance learning but rather how it is incorporated into learning activities is what makes the difference. The integration of ICTs in several subject areas including Modern Studies, Languages, Science and the Arts were examined. The data collected revealed that different subject cultures impact differently on how ICT is used in the classroom with History and Geography teachers appearing to be the most technophobic. [14] found that

"…for some subject areas and for some teachers, ICT was seen as a Trojan Horse, secretly bringing in new approaches to learning that conflicted with the deep grammar of the subject". However, despite this obvious aversion to technology use in the classroom, the history teachers who participated in the project reported several positive outcomes with regards to ICT integration in the projects implemented. Teachers reported improvements in the writing skills of lower ability students, increased levels of interaction among students, greater student enthusiasm and engagement and an increase in confidence for both the teacher and the students.

3. MATERIALS AND METHODS

3.1 Research Design

This investigation used a non-experimental design. The design of the survey was descriptive and cross-sectional in nature.

3.2 Population, Sample Size and Sampling Technique

The target population for this study was students of Wurishei Community Al-Badah Junior High School. The survey employed simple random sampling technique in selecting the sample for the study. A total sample size of 45 was selected from the target population for the study.

3.3 Instruments

The study used multiple data collection instruments for gathering information pertinent to the research. The instruments included questionnaire, interviews and observation. These techniques were appropriate because the study sought an in-depth information on students' opinions, experiences and acquisitions regarding the perceived influence of ICTs on students' teaching and learning at Wurishei Community Al-Badah Junior High School.

3.4 Data Collection Procedure

A combination of data collection tools was employed to collect qualitative and quantitative data on students of Wurishei Community Al-Badah Junior High School for the survey. These include the administration of structured and semi-structured questionnaire to respondents to collect primary data. The questionnaire was divided into four parts: socio-demographic characteristics of the students, ICT facilities available for students of Wurishei Community Al-Badah Junior High School for teaching and learning, the perceived influence of ICTs on students for learning and the challenges associated with the use of these ICTs by students for learning.

3.5 Pre-intervention

During the first week in the classroom, the researchers observed students on the use of ICTs in order to get much information about its influence on them. It was very much amazing that, pupils' level of ICTs usage on learning was low. Again, students were made to identify and give simple uses of some ICTs in the school. It was observed that, students of Wurishei Community Al-Badah Junior High School could identify computer as the only ICT tool for learning. Moreover, the teaching of ICT was teacher-centred and this approach limited students from realizing the benefits of ICTs on learning as shown in Table 1.

3.6 Intervention

After an interaction with the students and the ICT teacher, a lesson was organized with Teaching and Learning Materials (TLMs) on ICTs to brief students focusing on computers, smart phones and the Internet as was part of the curriculum. Typically, the lesson included:

- Fundamentals: basic terms, concepts and operations of Computers
- Use of the keyboard and mouse
- Use of productivity tools such as word processing, spreadsheets, data base and graphics programs
- Use of research and collaboration tools such as search engines and email
- Basic skills in using programming and authoring applications such as Logo or HyperStudio
- Developing an awareness of the social impact of technological change
- Messaging
- Teleconferencing

An exercise was given to students after the lesson to mention some common ICTs used daily to improve learning in schools. Majority of students were able to mention computers, smart phones, internet as well as televisions and radio. The researchers saw a remarkable improvement on students' knowledge of ICTs.

Table 1. Pre-intervention results of respondents

Respondents	Frequency	Percentage (%)
ICTs usage in learning		
Students who could use ICTs to learn fairly	0	0.00
Students who could use ICTs to learn when supported	5	11.11
Students who could not use ICTs to learn at all	40	88.89
Total	**45**	**100.0**

Source: Field survey, 2016

Table 2. Post-intervention results of respondents

Respondents	Frequency	Percentage (%)
ICTs usage in learning		
Students who could use ICTs to learn fairly	38	84.44
Students who could use ICTs to learn when supported	7	15.56
Students who could not use ICTs to learn at all	0	00.00
Total	**45**	**100.0**

Source: Field survey, 2016

3.7 Post-intervention

As indicated earlier, students' usage of ICT tools was very low. As a result, students could not integrate ICTs on learning in all subjects. However, taking students through the lesson with hands-on ICT tools aroused their interest. Students now developed interest on the tools and were prepared to even spend to have lessons in private ICTs centres. In conclusion, comparing the influence of ICTs on learning by students before and after the intervention, it could be observed that, the intervention worked as shown on Table 2.

3.8 Analysis of Data

Microsoft Excel was used as software for data input and analysis. Each objective of the study was analyzed by using appropriate statistics measures. Descriptive statistical measure was employed in the analysis of objectives 1 and 2.

4. RESULTS AND DISCUSSION

4.1 Socio-demographic Characteristics of Respondents

Students were the major stakeholders in the study; hence their socio-demographic characteristics are presented in Table 3. Findings show that most respondents are male (62.22%) and less than half are female (37.78%). With regards to age (years), majority of students are between the ages of 13-15 years. Again, all forms were given the chance to be fairly (33.33%) represented in the study.

Table 3. Socio-demographic characteristics of respondents

Respondents	Frequency	Percentage (%)
Gender:		
Male	28	62.22
Female	17	37.78
Total	**45**	**100.0**
Age (years):		
< 12	8	17.78
13-15	32	71.11
16-20	4	8.89
> 20	1	2.22
Total	**45**	**100.0**
Class:		
Form one	15	33.33
Form two	15	33.33
Form three	15	33.33
Total	**45**	**100.0**

Source: Field survey, 2016

4.2 ICTs Available to Students for Learning

Fig. 1 shows the distribution of ICTs that are available to students for learning at Wurishei Community Al-Badah Junior High School. All students (100%) indicated that there are Personal Computers and Phones for teaching and learning. Similarly, majority of students (84.44% and 77.78%) revealed that there are CD/DVD Player and Television for teaching and learning respectively. Finally, less than half of students (11.11% and 4.44) noted that there are Modem and Printer for use by students.

4.3 Application Systems Available to Students for Learning

Fig. 2 shows the distribution of Application Systems that are available to students for learning at Wurishei Community Al-Badah Junior High School. All students (100%) indicated that Microsoft (MS) Office Word is available for teaching and learning. However, students did not know that MS Office suite contains all the other application software for their use and this could be attributed to the teachers' lack of knowledge on the application package.

4.4 Students' Perception of the Use of ICTs in Teaching and Learning

Fig. 3 shows the distribution of perceived influence of the use of ICTs in teaching and learning by students of Wurishei Community Al-Badah Junior High School. Most students (65%) perceived the influence of the use of ICTs in their learning to be very interactive. This confirms the assertion made by [15] that students perceive the use of ICT in teaching and learning to be interesting, easier and more fun for them. Less than half (30%) perceived the influence of the

use of ICTs in learning to have produced more fun, while 5% perceived the influence of the use of ICTs in learning to be motivating.

4.5 Challenges Inherent in the Use of ICTs in Teaching and Learning

Students (44.44%) of Wurishei Community Al-Badah Junior High School indicated that limited duration of ICT lessons as well as teachers' inability to cater for individual learning needs during classes are among factors militating against the use of ICT in learning. [16] indicated that some teachers perceive the use of ICT in teaching to be skewing the lesson to computing only without students listening to the subject matter and that was time consuming using the technology. The study argued that such an experience indicates teachers" lack of pedagogical skills in handling issues related to the use of ICT in the classroom. Essentially, it is a matter of capturing students" attention. Less than half of the students (11.12%) expressed that the mode of delivery of ICT lessons are always faster than their understanding making it difficult for them to catch up as revealed in Table 4.
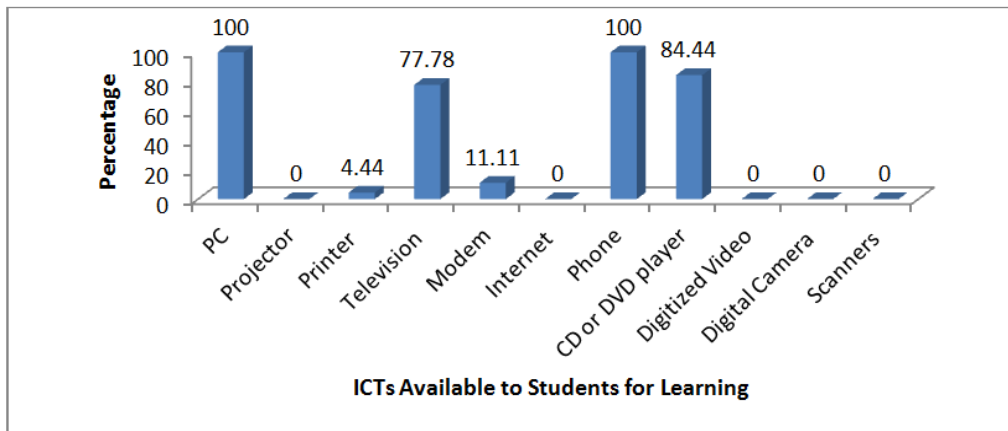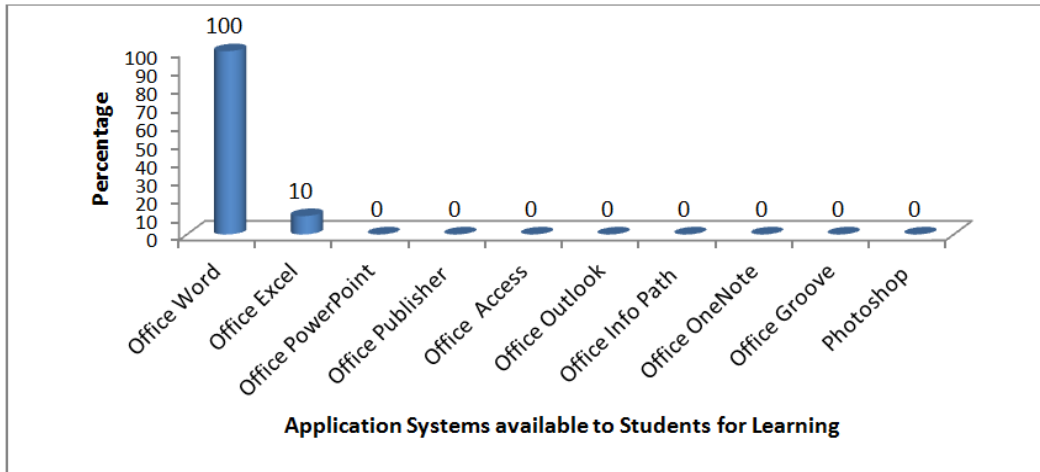

Fig. 1. ICTs available to students for learning
Source: Field survey, 2016

**Table 4. Challenges inherent in the use of ICTs in teaching and learning**

Respondents	Frequency	Percentage (%)
Challenges		
Limited duration of ICT lessons	20	44.44
Teachers' inability to cater for individual learning needs during classes	20	44.44
Mode of delivery of ICT lessons	5	11.12
Total	**45**	**100.0**

Source: Field survey, 2016

Fig. 2. Application systems available to students for learning
Source: Field survey, 2016
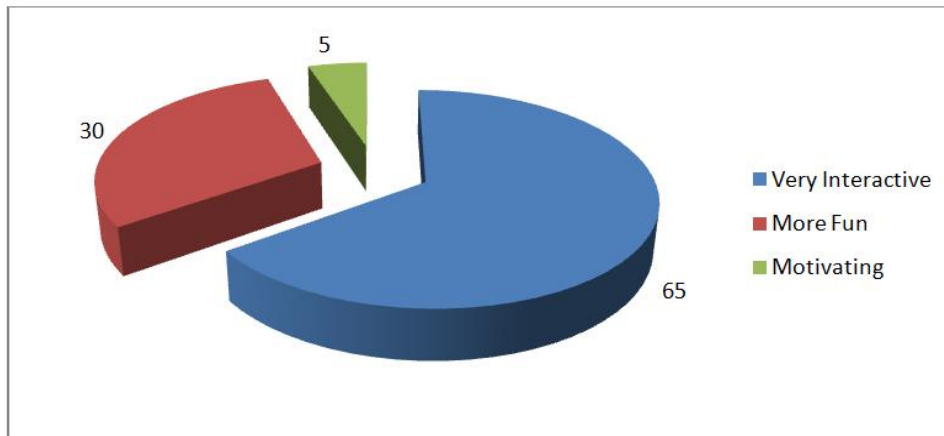
Fig. 3. Application systems available to Students for learning
Source: Field survey, 2016

5. CONCLUSION AND RECOMMENDA-TION

The findings of the study revealed that some ICTs facilities are available for learning by students of Wurishei Community Al-Badah Junior High School. However, very little use is made of these ICTs by students of the school, hence lowering the return of investment on scarce national resources. The study also established factors that militated against the use of ICTs by students to include limited duration of ICT lessons as well as teachers' inability to cater for individual learning needs during classes. Also, the mode of delivery of ICT lessons is always faster than their understanding making it difficult for them to catch up. Students complained that their teachers' ICT knowledge and skills are very

intimidating to slow learners. Notwithstanding the low patronage of the use of ICTs by students of Wurishei Community Al-Badah Junior High School for learning, those that are able to use it perceived the influence of the use of ICTs in their learning to be very interactive, more fun and motivating. From the above discussion of the study, the following recommendations are made.

- Although ICT lessons are on-going in the school, ICT teachers should consider as a matter of urgency incorporate more TLMs into the lessons to make it more interactive for students. This calls for teachers to modify their pace of delivery of ICT lessons to enable slow learners acquire the needed skills.

9

- The headmaster of the school should arrange with teachers to have an extended period of ICTs lessons for students as this will enable them catch up.
- The headmaster should commission a team of teachers to write a proposal to be directed to the "Better Ghana Agenda Secretariat" or RLG Limited to request for computers for the school.
- In order to derive the maximum benefit regarding the use of ICT facilities at Wurishei Community Al-Badah Junior High School, an action research should be conducted to identify and solve the issue surrounding the use, challenges and perception of students on the use of ICTs for teaching and learning.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. ICT4AD. The Ghana ICT for accelerated development process. National ICT policy and Development Plan; 2003.
2. Ghanaweb. The National Fiber-Optic (Volta Project). Volta River Authority; 2004a.
   Available:http://www.ghanaweb.com/Ghana/Homepage/feature/brouse.archeive.php
   (Accessed on 15th June, 2016)
3. Ghanaweb. Ghana and ICT: Strides, challenges and the way forward. UNDP definition of ICT; 2004b.
   Available:http://www.ghanaweb.com/ghanahomepage/feature/brouse/.php
   (Accessed on 15th June, 2016)
4. Ministry of education. ICT I Education Policy; 2008.
5. Hag S, Cumming M, McCubbrey DJ. Management information system for the information age, third edition. Published by McGraw-Hill, Avenues of Americas, New York; 2002.
6. Redid VU. Role of ICTs in education and development: Potential, pitfalls and challenge. Undated
7. Pelgrum W, Law N. ICT in education around the world: Trends, problems and prospects, Paris: UNESCO. International Institute for Educational Planning; 2003
8. Kozma R. National policies that connect ICT-based education reform to economic and social development. Human Technology. 2005;1(2):117-156.
9. Hawkridge D. Computers in third world schools. The example of China. British Journal of Educational Technology. 1990; 21(1):4-20.
10. Bigum C. Teachers and computers: In control or being controlled? Australian Journal of Education. 1997;41(3):247-261.
11. Drent M, Meelissen M. Which factors obstruct or stimulate teacher educators to use ICT innovatively? Computers and Education. 2008;51(1):187-199.
12. Balanskat A, Blamire R, Kefala S. A review of studies of ICT impact on schools in Europe, European Schoolnet: European Communities; 2006.
13. Lai K, Pratt K. Positive to a degree: The effects of ICT use in New Zealand schools. Computers in Schools. 2007;24(3-4):95-109.
14. Sutherland R, Armstrong V, Barnes S, Brawn R, Breeze N., Matthewman S, Olivero F, Taylor A, Triggs P, Wishart J, John P. Transforming teaching and learning: Embedding ICT into everyday classroom practices. Journal of Computer Assisted Learning. 2004;20(6):413-425.
15. Cox M, Christina Preston C, Cox K. What factors support or prevent teachers from using ICT in their classrooms? Paper presented at the British Educational Research Association Annual Conference, University of Sussex at Brighton. September 2-5; 1999.
16. Mwalongo A. Teachers' perceptions about ICT for teaching, professional develop-ment, administration and personal use. International Journal of Education and Development Using Information and Communication Technology (IJEDICT). 2011;7(3):36-49.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/21680