

# Evaluating Junior High School Teachers' ICT Competences for Technology Integration into Teaching and Learning in Akatsi South Municipality in the Volta Region of Ghana

Cephas Lokpo

Department of Mathematics and Computer Studies, Akatsi College of Education, Akatsi, Ghana

## Abstract

A lot of research work has been done in various areas of ICT integration into teaching and learning to determine the progress, challenges and key factors that come into play in implementing ICT in education. Some of the challenges identified in these research works include lack of ICT infrastructure, lack of administrative support, inadequate ICT tools such computers and data projectors, lack of or unstable electricity, lack of internet connectivity, teachers' negative attitude, teachers' lack of or inadequate requisite ICT knowledge and competences, and lack of technical know-how. However, the determination of the level of teachers' ICT knowledge and competences which is indispensable factor in determining the quality and effectiveness of ICT integration is conspicuously missing. This study examined the level of Junior High School (JHS) teachers' ICT knowledge and skills for ICT integration into teaching and learning in Akatsi South Municipality in the Volta Region of Ghana. The study applied a primary cross-sectional quantitative survey research design approach with 164 participants to determine the level of JHS teachers' knowledge and competences in the use of ICT for personal and instructional purposes. The questionnaire consists of 20 items which was used to elicit information from selected teachers. Data collected was analyzed using descriptive statistics. The result showed that with regard to participants' digital competences for personal tasks, 19.8% have extremely insufficient, 32.2% have insufficient, 38.5% have sufficient and 9.5% extremely sufficient. In relation to teachers' knowledge and skills for ICT integration into teaching and learning, 24.5% have extremely insufficient, 36.8% have insufficient, 30.3% have sufficient, and 8.4% have extremely sufficient. In conclusion, majority of participants have insufficient knowledge and skills required for the use of ICT for performance of personal tasks and instructional activities and consequently cannot integrate ICT into teaching and learning or implement it effectively due to their very insufficient or insufficient level of knowledge and skills in the use of ICT.

**Keywords:** ICT integration, knowledge and skills, teaching and learning, technological pedagogical content knowledge

## Introduction

Provision in the New Basic School Curriculum in Ghana which has been under implementation since 2019/2020 academic year emphasized child-centered approach in which the teacher plays the role of a facilitator for effective teaching and learning. This approach is to be supported by activity-based learning

in which learners are engaged in learning activities that lead to discovery of knowledge instead of mere memorization and recall of facts known as rote learning. In this learner-centered pedagogy, the principles of differentiation, scaffolding, and use of ICT as a pedagogical tool are highlighted. These important features of the New Basic School Curriculum are in line with its rationale which is to make education at the pre-tertiary level more responsive to the human resource and development needs of Ghana. The new standard based curriculum focusses more on the affective and psychomotor domains of learning for total development of values and character of the Ghanaian child rather than cognitive development and examination which were essential features of the objective based curriculum. Information and Communication Technology tools occupy a central stage in the proper and successful implementation of the new standard curriculum. With this fact established, it is crucial to examine the knowledge and competences of teachers in ICTs and their uses in preparation and delivery of instruction in and outside the classroom.

The knowledge, skills, and capabilities expected of teachers in this 21<sup>st</sup> century cannot be overemphasized. Husain (2010) pointed out four key competencies teachers need to develop as follows: (1) the use of ICT skills in developing and presenting information, (2) preparation of a learning environment that is ICT based, designing effective learning experiences and using ICT to create rich learning environments and understanding of how technology can promote student learning; (3) using ICT to establish dynamic and powerful instructional strategies and environment, that is, using ICT as didactical tool and (4) demonstrating knowledge and skills for using technology in ethical, legal and safe ways and to use humor and good manners during the teaching and learning process.

In a synthesis report on ICT Competency Framework for Teachers (ICT-CFT), with contextualization and piloting in Nigeria and Tanzania, Hooker, Mwiyeria and Verma (2011), stated that the foundation for effective change is competence with integration of technology in education. They pointed out that teachers need effective ICT skills and strategies for lifelong learning and that teachers must demonstrate authentic application of technology in integrated manners that will promote engagement of students in problem solving, collaboration, and creatively enhancing their abilities and capabilities in acquiring and constructing knowledge.

The Ghana Education Strategic Plan 2018 - 2030 emphasized three key areas of priority adopted under the National Pre-Tertiary Education Curriculum Framework for improving Ghana's educational system. It is of utmost importance to mention that the second priority area is to improve quality of teaching and learning and Science, Technology, Engineering, and Mathematics (STEM) at all levels. This key priority area focuses on ensuring the highest quality of teaching through STEM activities, research, and selection and use of appropriate teaching and learning resources including ICTs (Ministry of Education, 2018). In the National Pre-tertiary Education Curriculum Framework, ICT in education policy statement clearly brings to the fore the need for integration of ICT in education through the provision of Internet and computer networks, computer labs, and ICT equipment such as laptops for facilitators and learners to facilitate effective teaching and learning as advocated in the Ghana education reform of 2007. The ICT in education policy proposes capacity development of facilitators and the use of ICT as pedagogical tool.

### Statement of the Problem

Under the 2007 educational reform in Ghana, Information and Communications Technologies (ICTs) was recognized as a key player in widening access to education and for facilitating educational delivery and training at all levels. For this reason it was given recognition as a key priority area. Furthermore, ICTs have great capabilities for knowledge dissemination, knowledge acquisition, effective learning, improvement of teacher knowledge, skills, attitudes, inquiry as well as increasing opportunities for more learner centered teaching methods, promoting inclusivity and fostering collaboration, creativity and higher order thinking among others. One of the elements underpinning the ICT policy framework is capacity building which focuses on teachers' pre-service and in-service professional development (Ministry of Education, 2008; 2015). The 2015 edition of ICT policy in education in Ghana which aims at bringing ICT in education policy to a new level of relevance and currency and also ensure sustainability of its implementation stated three pillars of ICT in education delivery with the second pillar being ICT integration into teaching and learning (Ministry of Education, 2015). However, with many years of ICT in education policy implementation, a good number of JHS teachers do not use ICTs in their instructional delivery. Natia and Al-hassan (2015), in their research stated that 69% of female and 50% of male teachers in basic schools use ICT to teach. By implication, 31% of female and 50% of male teachers do not use ICT in teaching. Their study again stated that teachers in basic schools have weak ability to use computer to teach and research due to lack of access to Internet, electricity/power problem, inadequate number of computers and technical know-how. Their research findings however, did not reveal the level of knowledge and skills of the teachers in the use of ICT for teaching and learning which can help determine the effectiveness of ICT integration or otherwise. This study therefore seeks to evaluate the level of JHS teachers' knowledge and skills in ICT use for personal and instructional purposes.

### Purpose of the Study

The purpose of the study is to assess JHS teachers' level of sufficiency of knowledge and skills in:

1. Using ICT for performing personal tasks and
2. Using ICT for instructional purposes.

### Research Questions

1. What is the level of sufficiency of JHS teachers ICT skills and knowledge for personal tasks?
2. What is the level of sufficiency of JHS teacher's ICT knowledge and competence in using ICT for teaching and learning?

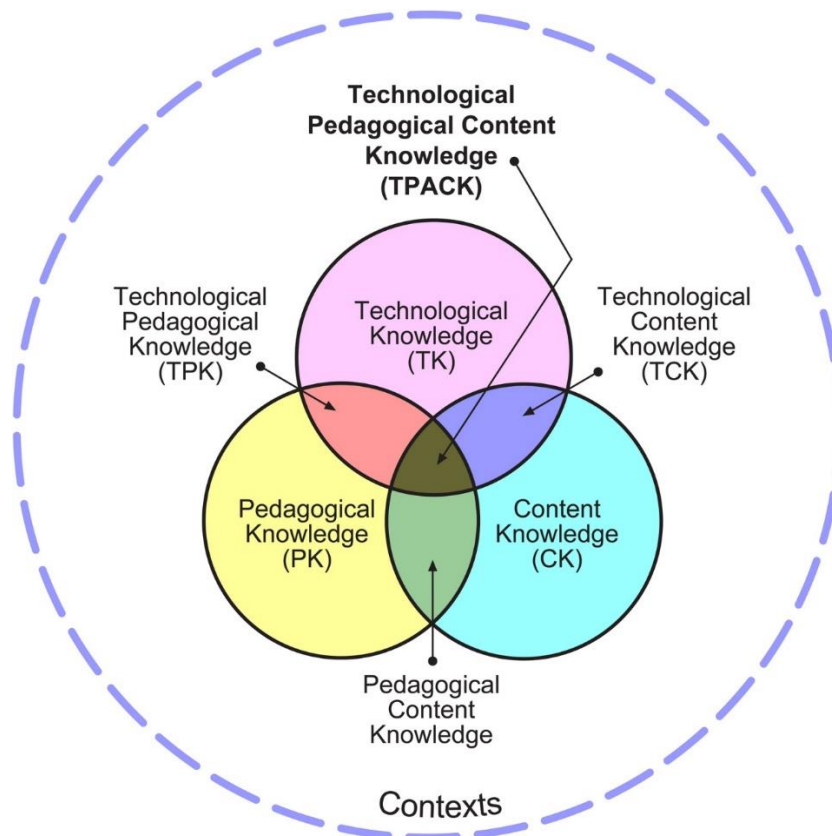
## LITERATURE REVIEW

### Theoretical Perspective

#### Technological and Pedagogical Content Knowledge (TPACK) Theory

TPACK is a framework developed by Punya Mishra and Matthew J. Koehler in 2006. It was built on Shulman (1986) concept of Pedagogical Content Knowledge (PCK). Mishra and Koehler (2006) added technology to Shulman's PCK and the result was described as TCPK, an intertwining of technology, content and pedagogy knowledge, which was later renamed TPACK. It is a theoretical framework for comprehending knowledge required of a teacher for integration of technology effectively. It depicts knowledge of deploying technology to implement teaching approaches for diverse types of subject matter. It therefore focusses on three domains of knowledge namely content knowledge (CK), pedagogical

knowledge (PK), and technological knowledge (TK), and how these domains interrelate. TPACK treats content, pedagogy and technology mutually and combines the three concepts in an intricate relationship. TPACK is an understanding that emerges from interactions among content, pedagogical and technological knowledge. It underpins real comprehension and in-depth expert teaching with technology, and therefore becomes the foundation of effective teaching with technology. It requires a comprehension of using technologies in the presentation of concept, pedagogical techniques that employ technologies in productive approaches to impart content, knowledge of what renders concepts simple or complex to study and how technology can proffer solution to some of the challenges that confront students, knowledge of students' previous knowledge and theories of epistemology, and knowledge of how technologies can be employed to upgrade current knowledge to develop fresh epistemologies or reinforce previous ones (Mishra & Koehler, 2006). The TPACK framework was proposed in order to emphasize the need to situate technology knowledge within content and pedagogical knowledge. With the advent of digital technologies, technology has become an essential element of the lives of both teachers and students as it changes the modes of student-teacher interaction by providing technology-supported learning environment (Baran, Chuang, & Thompson, 2011). Seven components included in the TPACK; the rest six are described below.



**Figure 1: The components of the TPACK framework (Graphic from tpack.org)**

**Technological knowledge** entails an understanding of how to make use of computer hardware and software, presentation documents and other technologies in educational context. It further comprises the proficiency to adapt and acquire knowledge and skill on new technologies.

**Pedagogical knowledge** includes knowledge on teaching methods, fundamental theories and concepts of teaching, knowledge of ways by which students acquire knowledge, planning and implementation of instruction, management of the learning environment, student assessment, values, goals, and educational strategies, as well as instructional processes and practice. It comprises knowledge about teaching and learning, competences, philosophies and notion about teaching. PK is a pool of skills that the teacher ought to acquire so as to possess the ability to handle and coordinate teaching and learning activities to attain the expected learning objectives.

**Content knowledge** highlights knowledge and mastery of the subject matter that is to be taught or learnt. This is the knowledge about concepts, procedures, and structures in a specified field.

**Pedagogical Content Knowledge (PCK)** is concerned with how pedagogical and content knowledge connect and relate for effective teaching. PCK signifies the way in which the content can be prepared and conveyed to render it understandable to learners. A teacher's pedagogical and content knowledge are inseparably connected. In reference to PCK, Shulman (1986) stated that for an effective teaching to take place, it requires more than just understanding content and pedagogy as isolated concepts. PCK identifies the verity that diverse content will require diverse teaching approaches.

**Technological Content Knowledge (TCK)** denotes knowledge of subject matter representation with technology. It is the understanding of how content and technology impact and influence each other. It is the knowledge of how to employ an evolving technology to represent particular concept in a specific content area.

**Technological Pedagogical Knowledge (TPK)** indicates knowledge of implementing diverse teaching methods using technology. TPK involves the capability to recognize how technology influences the methods and strategies of teaching and how effective teaching and learning can be accomplished with technology. It encompasses the identification of the limitations and affordances that technology can bring to bear on pedagogical strategies, methods and designs (Abbitt, 2011).

### **Using ICT to Promote Effective Teaching and Learning**

Ghana's Educational Reform of 2007 proposed ICT integration in education to enhance effective teaching and learning. This was to be achieved through the provision of computer laboratories, Internet and network connectivity, laptops for learners and teachers. Capacity building was also mentioned as a means of achieving ICT integration (Ministry of Education, 2018).

Suryani (2010) in a study which considered the benefits and difficulties of ICT in education averred that the use of ICT for teaching and learning promotes active participation of learners. Active participation in lessons enhances easy assimilation and retention of knowledge and skills. The learner is able to understand procedures, processes, and concepts better by engaging in a lesson facilitated using ICT as pedagogical tools. Suryani explained that, by the use of the Internet, learners are able to explore and find the information they need and they will not totally depend on their teachers as they are able to engage in independent learning. Mikre (2011) also stated that ICT facilitate the acquisition and absorption of knowledge greatly and this offers developing countries unprecedented opportunities to enhance

educational systems. Similarly, Bhattacharjee and Deb (2016) stated that ICTs is an effective information acquiring tool that enables students to look for information from multiple sources for their independent learning.

Bhattacharjee and Deb (2016) again pointed out that there is transformation of schools and classrooms through the use of ICT. The classroom is changing its look from one way communication to two way communication where teachers as well as students participate in classroom discussion. ICT is bringing in new curriculum based on real world problems, providing tools for enhancing learning, and providing teachers and students more facilities and opportunities for feedback. According to them ICT are used for Continuous and Comprehensive Evaluation (CCE) which helps the teacher as well as the student in the teaching and learning process. They further stated that ICT has enabled better and swifter communication in that ideas are presented more effectively and in a more relevant way. According to Ghavifekr and Rosdy (2015), integration of ICT into the school curriculum will help teachers to meet the global requirement to replace traditional teaching methods with a technology-based teaching and learning tools and facilities. They added that ICT has the capability of providing dynamic and proactive teaching and learning environment, and that students learn better within technology-based learning environment which improves and increases quality. They further stressed that almost all subjects can be learned more effectively through technology-based tools.

### **Skills and Competences Required for ICT Integration into Teaching and Learning**

The integration of ICT into education will lead to the creation of new possibilities for teachers and learners to activate new ways of acquiring and analyzing information and that ICT will promote access to education and improve the quality of teaching and learning on equitable basis. One of the seven thematic areas outlining the lead guiding principles, objectives and strategies in Ghana's ICT in education policy document is capacity building. It is contained in the policy document that in order to exploit ICT effectively, the intended users must be competent enough to do so. By implication, the user must have the skills, knowledge and attitudes required for using the technology for the tasks required (Ministry of Education, 2015).

According to Bhattacharjee and Deb (2016), teachers in modern science and technological societies need more knowledge in ICT and skills to use ICT in the teaching and learning process. Teachers require knowledge and skills to use new digital tools to assist all learners achieve high academic standards. Education is now child centered so the teacher should prepare to use different technologies in the classroom to make teaching and learning interesting. In this regard the teacher is to play the role of a facilitator by creating a learning environment that is well resourced to enable learners explore and construct knowledge.

In an attempt toward the preparation of students for the current digital era, teachers are seen as key players in using ICT in their daily classroom activities. Teachers' readiness and skills in using ICT play crucial role in the use of ICT in education. Teachers need adequate skills to implement Information and Communication Technology and to have high level of confidence to use it in a classroom setting. Furthermore, teachers need insight into the pedagogical role of ICT to enable them use it meaningfully in the instructional process. Teachers should attend training courses to learn about ICT integration in the

teaching and learning process. Peer tutoring systems in which a more skillful teacher in ICT assists and guides teachers who are less experienced with ICT can also be used (Ghavifekr and Rosdy, 2015).

For teachers to exploit the ICTs realistically to improve teaching and learning, they must possess the knowledge and skills to use new digital tools and resources to assist all learners to attain high academic standards. The ICT competences expected of teachers are associated with content, pedagogy, technical issues, social issues, collaboration and networking. Teachers must have the ability to explore the opportunities provided through ICT in adapting learning and teaching to individual needs (Ratheeswari, 2018).

The teacher, who makes use of technology (the reasoned and effective use of resources and processes to support learning, performance, and instruction) and resources (tools and techniques as well as devices, artifacts, learning environments, and processes involved in designing, developing, deploying, evaluating and managing) is simply an educational technologist. The teacher deals with a lot of learning resources. He/she must be conversant with, understand and manage a wide range of devices and associated software including workstations, personal computers, tablet computers, and various operating systems and application software. These competences must be acquired through constant professional development and openness to new possibilities created by the affordances of new and emerging technologies in order to maintain currency and relevance as a professional practitioner (Huang, Spector, & Yang, 2019).

### **Teachers' Level of Skills and Competences in integrating ICT into Teaching**

A good number of teachers are not very clear about the potential benefits of technology use for facilitation and enhancement of learning. Though some teachers may have the right attitudes to technology, they refrain from using it due to low self-efficacy. They consider themselves as incapable of using technology to teach. Teachers also tend to have resistance and show lack of enthusiasm toward the use of ICT in education. In addition, many teachers lack the required skills due to lack of training to build the competence and capacity to use ICT for teaching (Mikre, 2011).

The United Nations Education, Scientific and Cultural Organization (UNESCO) set out the benchmark for teacher ICT competency framework in collaboration with various industrial leaders and global subject experts. The framework to empower teachers emphasized three important stages of successive teachers' development namely knowledge acquisition, knowledge deepening, and knowledge creation (UNESCO, 2023). Knowledge acquisition which encompasses technology or digital literacy enables teachers to help students to use ICT to learn effectively. The ICT competency framework for teachers provides a structure from which digital competencies identification is enabled and this forms the basis for ICT in education policy mandates, curriculum constructs, and pre and in-service training as well as promote the capacity development of educators to adopt appropriate use of technology in their professional practice. Some of the competencies identified include understanding of national priorities enshrined in the ICT in education policy, use of ICT to support curriculum, assessment strategies, pedagogy, school and class organization, administration and professional development.

Among the skills required of teachers in ICT are basic and advanced ICT skills, Internet skills for information seeking and sharing, and Internet skills for communication. With these skills teachers are

expected to use ICT to perform tasks such as teaching and learning, searching for educational resources, preparation of presentation and delivery materials, preparation of lesson plans (Umar and Yusoff, 2014).

**Materials and Methods**

**Research Design:** The study applied a primary cross-sectional quantitative survey research design approach. This approach was used to determine the level of JHS teachers’ knowledge and competences in ICT use for personal and instructional purposes. Numerical data were collected using questionnaires in a random sampling method. The data were analyzed statistically to find patterns and averages in order to make inferences and predictions which could be applied to wider populations.

**Participants:** 164 JHS teachers were drawn from a total number of 325 using a probability sampling technique from 9 basic schools in the Akatsi South Municipality to voluntarily participate in the study. This sample size was arrived at by using Yamane’s sample size calculation formula (since all that is known is the population size) with a confidence level,  $1-\alpha = 94.5\%$  and margin of error,  $e = 5.5\%$  (0.055) which resulted in a representative sample of about 50.5% of the total population.

**Instrumentation:** Questionnaires were administered to respondents. A four-point Likert scale was used to rate the items ranging from extremely insufficient, insufficient, sufficient, and extremely sufficient. The items were constructed to elicit responses on general basic knowledge in ICT, and basic knowledge required for successful ICT integration. The items covered 20 knowledge areas in all and were divided into two sections. Section A comprises items 1-9, which measure general basic knowledge of teachers in ICT. Section B has items 10-20, which measure teachers’ knowledge and competences in ICT integration. The items were adapted from (Ghavifekr & Rosdy, 2015). Cronbach Alpha formula which gave an index of 0.99 was used to determine the reliability of the instrument. The value for each item is presented in the table below:

**Table 1: Item Reliability Statistics (Overall Cronbach’s  $\alpha=0.99$ )**

Item	Cronbach’s $\alpha$
1. Use of Operating Systems	0.957
2. Identification of legal, ethical and societal issues related to use of ICT	0.959
3. Use of Word processor for personal tasks	0.959
4. Use of Spreadsheets for personal tasks	0.962
5. Use of presentation software for personal tasks	0.963
6. Use of ICT for communication	0.922
7. Use of ICT for data collection	0.943
8. Use of ICT to enhance personal development	0.937
9. Use of ICT for knowledge management	0.918
10. Use of Word processor for instructional purposes	0.959
11. Use of Spreadsheets for instructional purposes	0.950
12. Use of presentation software for instructional purposes	0.957
13. Use of communication tools to support instruction	0.945
14. Use of ICT to support instruction out of the classroom	0.943



15. Use of ICT to support instruction process in the classroom	0.947
16. Use of computer-assisted instructional materials	0.946
17. Use of ICT in assessment process of a course	0.946
18. Evaluation of computer-assisted instructional materials	0.928
19. Identification, evaluating and selecting ICT resources	0.966
20. Download and use of learning resources from the Internet	0.933

**Data Collection and Analysis:** the questionnaires were distributed to the respondents through their various heads of schools who had first-hand briefing on the intent of the study and how to respond to the items. Respondents had enough time to provide their responses to the items individually. A total of 164 participants responded to the questionnaire which were retrieved and analyzed.

**Results**

**Table 2: Results on the level of knowledge sufficiency**

Items	EIn (%)	In (%)	S (%)	ES (%)
1. Use of Operating Systems	28.0	32.9	33.5	5.5
2. Identification of legal, ethical and societal issues related to use of ICT	20.7	33.5	35.4	10.4
3. Use of Word processor for personal tasks	21.3	31.7	36.0	11.0
4. Use of Spreadsheets for personal tasks	22.6	36.0	35.4	6.1
5. Use of presentation software for personal tasks	21.3	39.6	31.7	7.3
6. Use of ICT for communication	16.5	22.0	43.3	18.3
7. Use of ICT for data collection	17.1	30.5	40.9	11.6
8. Use of ICT to enhance personal development	15.2	32.3	42.1	10.4
9. Use of ICT for knowledge management	15.9	31.7	48.2	4.3
10. Use of Word processor for instructional purposes	25.0	40.9	26.2	7.9
11. Use of Spreadsheets for instructional purposes	31.1	36.0	26.2	6.7
12. Use of presentation software for instructional purposes	28.7	36.6	26.8	7.9
13. Use of communication tools to support instruction	16.5	34.1	42.1	7.3
14. Use of ICT to support instruction out of the classroom	19.5	32.3	43.3	4.9
15. Use of ICT to support instruction process in the classroom	23.2	43.9	29.3	3.7
16. Use of computer-assisted instructional materials	24.4	45.7	23.8	6.1
17. Use of ICT in assessment process of a course	30.5	38.4	23.2	7.9
18. Evaluation of computer-assisted instructional materials	30.5	42.1	23.8	3.7
19. Identification, evaluating and selecting ICT resources	24.4	35.4	32.9	7.3
20. Download and use of learning resources from the Internet	15.9	19.5	36.0	28.7

\* EIn = Extremely Insufficient In = Insufficient S = Sufficient ES = Extremely Sufficient

**Result on teachers’ ability to use operating systems**

The results indicate that 28.0% of respondents have extremely insufficient knowledge and skills in the use of operating systems and 32.9% have insufficient knowledge and skills. This implies about 61.0% do not have the ability to use computers and mobile devices conveniently and without limitations. 33.5% and

5.5% of participants have sufficient and extremely sufficient knowledge and skills in the use of operating systems respectively, giving a total of 39.0% having the competence in the use of operating systems.

#### **Results on the ability to identify legal, ethical, and societal issues that relate to the use of ICT**

20.7% and 33.7% of respondents have very insufficient and insufficient knowledge in identifying legal, ethical, and societal issues related to the use of ICT respectively, whereas 35.4% and 10.4% of them have sufficient and very sufficient knowledge in same respectively.

#### **Results on ability to use Word Processor to perform personal tasks**

The table presents 21.3% of respondents as having extremely insufficient knowledge and 31.7% as respondents who have insufficient knowledge and skills in the use of word processors to perform personal tasks. The percentage of respondents who have sufficient and very sufficient knowledge and skills in this area is 36.0 and 11.0.

#### **Results on ability to use spreadsheet application to perform personal tasks.**

The table shows 22.6% and 36.0% of respondents have extremely insufficient and insufficient knowledge and skills in the use of spreadsheet software for performing personal tasks respectively. Cumulatively, these give 58.5% of respondent who do not have sufficient knowledge and skills in the use of the software. Respondents who have sufficient knowledge and skills in the use of the software amount to 34.5% and those who are very proficient in the use of the software stand at 6.1%. Cumulatively, 41.5% of the sample can use the software without difficulty.

#### **Results on the ability to use presentation software for personal tasks**

In the table, 21.3% of the sample have extremely insufficient knowledge and skills in the use of presentation software, and 39.6% have insufficient level of knowledge and skills. A total of 61.0% does not have sufficient knowledge and skills to use presentation software for personal tasks. However, 31.7% and 7.3% have sufficient and very sufficient knowledge and skills for using the software, giving 39.0% cumulatively.

#### **Results on ability to use information and communications technology for communication.**

Results presented in the table indicate 16.5% and 22.0% of the sample have extremely insufficient and insufficient knowledge and skills in the use of ICT for communication respectively. These cumulate to 38.4%. There is also indication of 43.3% and 18.3% having sufficient and extremely sufficient knowledge and skills in using ICT for communication respectively, cumulating to 61.6%.

#### **Results on the ability to use information and communications technology for data collection**

The table shows that 17.1% and 30.5% of the sample have extremely insufficient and insufficient knowledge and skills in using ICT for data collection and these cumulatively gives 47.6%. On the other hand, 40.9% and 11.6% of the sample have sufficient and extremely sufficient knowledge and skills in this area.

**Results on ability to use ICT to enhance personal development**

From the table, there is indication that 15.2% and 32.3% of the sample have extremely insufficient and insufficient knowledge of the use of ICT to enhance personal development respectively. These give a cumulated percentage of 47.5. Also, indicated in the table is 42.1% and 10.4% of the sample having sufficient and extremely sufficient knowledge in the use of ICT to enhance personal development giving the sum of 52.5%

**Results on the ability to use ICT for knowledge management**

The results show that 15.9% and 31.7% of the sample have extremely insufficient and insufficient skills in using ICT for knowledge management respectively, giving a total of 47.6% not having sufficient knowledge and skills in this area. The results further indicated 48.2% and 4.3% of the sample have sufficient and extremely sufficient knowledge and skills respectively for knowledge management. This gives a cumulated of 52.5%

**Results on the ability to use word processors for instructional purposes**

In the table, it is indicated that 25.0% and 40.9% of the sample have extremely insufficient and insufficient knowledge and skills respectively in using word processors for instructional purposes, giving 65.9% cumulatively. It is also indicated that 26.2% and 7.9% have sufficient and extremely sufficient knowledge and skills respectively in using word processors for instructional purposes, summing up to 34.1%

**Results on the ability to use spreadsheet software for instructional purposes**

From the table, 31.1% and 36.0% of the sample have extremely insufficient and insufficient knowledge and skills respectively in the use of spreadsheet software for instructional purposes and these sum up to 67.1%. Also, 26.2% and 6.7% have sufficient and extremely sufficient knowledge and skills respectively in using spreadsheet software for instructional purposes. These give a sum of 32.9%.

**Results on the ability to use presentation software for instructional purposes**

The results in the table show 28.7% and 36.6% of the sample have extremely insufficient and insufficient knowledge and skills respectively in the use of presentation software for instructional purposes, and these give 65.2% cumulatively. Furthermore, 26.8% and 7.9% have sufficient and extremely sufficient knowledge and skills respectively in using presentation software for instructional purposes, and these sum up to 34.8%.

**Results on the ability to use communication tools to support instruction**

The table indicate 16.5% and 34.1% of the sample possess extremely insufficient and insufficient knowledge and skill respectively to use communication tools to support instruction. These give a sum of 50.6% of the sample. Also, 42.1% and 7.3% have sufficient and extremely sufficient knowledge and skills respectively in this area, and these sum up to 49.4% of the sample.

**Results on the ability to use ICT to support instruction outside the classroom**

The table presents 19.5% and 32.3% of the sample having extremely insufficient and insufficient knowledge and skills respectively in the use of ICT to support instruction out of the classroom. The sum of these give 51.8% of the sample. In addition, it is indicated 43.3% and 4.9% possess sufficient and

extremely sufficient knowledge and skills respectively for using ICT to support instruction out of the classroom, and these give a sum of 48.2% of the sample.

### **Results on the ability to use ICT to support instructional process in the classroom**

In the table, 23.2% and 43.9% of the sample possess extremely insufficient and insufficient knowledge and skills respectively for using ICT for supporting instructional process in the classroom, and these sum up to 67.1% of the sample. It is also indicated that 29.3% and 3.7% of the sample have sufficient and extremely sufficient knowledge and skills respectively for using ICT to support instructional process in the classroom, and these cumulated to about 33% of the sample.

### **Results on the ability to use computer-assisted instructional materials**

It is indicated in the table 24.4% and 45.7% of the sample possess extremely insufficient and insufficient knowledge and skills respectively to use computer-assisted instructional materials, and these give 70.1% of the sample. Further, it is shown that 23.8% and 6.1% possess sufficient and extremely sufficient knowledge and skills respectively to use computer-assisted instructional materials, and these sum up to 29.9% of the sample.

### **Results on the ability to use ICT in assessment process of a course**

For the use of ICT in assessment process of a course, 30.5% and 38.4% of the sample have extremely insufficient and insufficient knowledge and skills respectively, and these sum up to 68.9% of the sample. Further, 23.2% and 7.9% have sufficient and extremely sufficient knowledge and skills respectively, and these give 31.1% of the sample.

### **Results on the ability to evaluate computer-assisted instructional materials**

The results presented on evaluation of computer-assisted instructional materials show that 30.5% and 42.1% of the sample have extremely insufficient and insufficient knowledge and skills respectively, and these add up to 72.6% of the sample. Furthermore, 23.8% and 3.7% have sufficient and extremely sufficient knowledge and skills respectively for evaluating computer-assisted instructional materials. These sum up to 27.4% of the sample.

### **Results on the ability to identify, evaluate and select ICT resources for teaching**

It is shown in the table that 24.4% and 35.4% of the sample have extremely insufficient and insufficient knowledge respectively in identifying, evaluating and selecting ICT resources for teaching and learning. The sum of these is 59.8% of the sample. Further indication is that 32.9% and 7.3% possess sufficient and extremely sufficient knowledge respectively in identification, evaluation, and selection of ICT resources. These sum up to 40.2% of the sample.

### **Results on the ability to download and use learning resources from the internet**

The table shows 15.9% and 19.5% of the sample have extremely insufficient and insufficient knowledge and skills respectively in downloading and using resources from the internet, and these sum up to 35.4% of the sample. In addition, 36.0% and 28.7% of the sample have sufficient and extremely sufficient knowledge and skills respectively in downloading and use of learning resources from the internet. These add up to 64.6% of the sample.

**Table 3: Summary of results on teachers’ knowledge and skills in general use of ICT and knowledge in ICT integration into teaching and learning**

Items	Insufficient (%)	Sufficient (%)
1. Use of Operating Systems	69.0	41.0
2. Identification of legal, ethical and societal issues related to use of ICT	54.3	45.7
3. Use of Word processor for personal tasks	53.0	47.0
4. Use of Spreadsheets for personal tasks	58.5	41.5
5. Use of presentation software for personal tasks	61.0	49.0
6. Use of ICT for communication	38.4	61.6
7. Use of ICT for data collection	47.6	52.4
8. Use of ICT to enhance personal development	47.6	52.4
9. Use of ICT for knowledge management	47.6	52.4
10. Use of Word processor for instructional purposes	65.9	34.1
11. Use of Spreadsheets for instructional purposes	67.1	32.6
12. Use of presentation software for instructional purposes	65.2	34.8
13. Use of communication tools to support instruction	50.6	49.4
14. Use of ICT to support instruction out of the classroom	51.8	49.2
15. Use of ICT to support instruction process in the classroom	67.1	32.9
16. Use of computer-assisted instructional materials	70.1	29.9
17. Use of ICT in assessment process of a course	56.9	31.1
18. Evaluation of computer-assisted instructional materials	72.6	27.4
19. Identification, evaluating and selecting ICT resources	59.8	40.2
20. Download and use of learning resources from the Internet	35.4	64.6

### Findings and Discussions

#### Research Question 1: What is the level of sufficiency of JHS teachers ICT skills and knowledge for personal tasks?

With regard to basic knowledge for general use of ICT, JHS teachers were grouped into four classifications of level of competence namely extremely insufficient, insufficient, sufficient and extremely sufficient. Findings from analysis of items 1-9 revealed that comparatively, a few teachers’ level of knowledge and skills fall under extremely insufficient and extremely sufficient categories. Averagely, 19.8% of teachers

selected for the study have extremely insufficient knowledge and skills in the use of ICT. This percentage indicate about one-fifth of the teachers lack basic knowledge and skills in the use of ICT. This is rather surprising because from the onset of implementation of ICT in education policy, training programs were to be rolled out to help teachers acquire the knowledge and competences required for ICT use and integration. 32.2% of the JHS teachers have insufficient knowledge and skills in the use of ICT. This is close to one-third of the sample under study. These two categories put together give 52.0% representing teachers who have very limited or limited knowledge and skills in the use of ICT in general terms, and this is more than half of the sample under study. This findings point to the fact that there is a good number of teachers who lack the basic knowledge and skills required for using ICT effectively.

It was found that 38.5% of the teachers selected for this study possess sufficient knowledge and skills in the use of ICT. This represent teachers who have the required knowledge and skills for using ICT to perform personal tasks. As established, a few number of teachers have extremely sufficient knowledge and skills in the use of ICT and the percentage is 9.5% representing those who very competent and proficient in using ICT to perform various basic personal tasks. Putting these two categories together, it can be said that 48.0% of the teachers possess the required knowledge and skills in the use of ICT. It can be inferred that majority of teachers does not have the requisite knowledge and skills for effective use of ICT. The implications are that this category of teacher cannot integrate ICT into teaching and learning even if they have the content and pedagogical knowledge. Either they have inadequate or lack in-service training to equip and prepare them to use ICT.

### **Research Question 2: What is the level of sufficiency of basic school teacher's ICT knowledge and competence in using ICT for teaching and learning?**

Finding from analysis of items 10-20 which seek to determine the level of knowledge and skills of teachers in integrating ICT into teaching and learning indicate that 24.5% of teachers have extremely insufficient knowledge and skills in integrating ICT into teaching and learning. This percentage is close to one-quarter of the sample. Inferentially, with all other factors necessary for ICT integration catered for, this category of teachers are unable to integrate ICT into teaching and learning. It is also found out that 36.8% of teachers have insufficient knowledge and skills for ICT integration, and consequently cannot integrate ICT into teaching and learning effectively. Merging these two categories of teachers implies 61.3% of teachers are unable to integrate ICT into teaching and learning effectively even if other factors such as unavailability of electricity, lack of internet connectivity, unavailability of ICT tools such as computers and data projectors, high student-computer ratio, etc. which hinder ICT integration are catered for. This finding agrees with Fu (2013) who listed among others inadequate skills for managing teaching resources, low software competence, lack of specific knowledge about technology, and insufficient knowledge and skill of ICT in instructional situation as some of the factors that serve as barrier to ICT integration. He further pointed out factors that influence ICT integration which include comprehending of ICT use, technology skills, and technology self-efficacy. Also, Ghavifekr and Rosdy (2015) pointed out that teachers' readiness and skills in using ICT play a significant role in the use of ICT in education. Mikre (2011) also stated that teachers lack the needed skill to match the technology and innovative pedagogies that promote students' learning. He noted that many teachers have not acquired the essential skills in information technology and neither do they have the special training required to be able to use the new resources in the classroom. The two categories of teachers who possess the required knowledge and skills for ICT integration constitute 38.7% of the sample. These are those who have sufficient and extremely sufficient knowledge and skills

in using ICT to facilitate teaching and learning effectively of which 30.3% and 8.4% represent teachers who have sufficient and extremely sufficient knowledge and skills respectively.

A careful analysis of the results in Table 22 revealed that 61.6% and 64.6% of teachers are able to use ICT for communication and downloading resources from the internet respectively unlike other areas where majority have limited knowledge and competence. These two knowledge areas relate to the use of mobile devices such as mobile phones which every teacher is likely to have. Inferentially, it is noted that availability of ICT tools increase the probability of use and mastery of the technologies. Teachers require professional development to acquire skills with specific appliance of ICT, incorporation into current curricula, curricula variations associated with its application, adjustments in teacher responsibility, and on foundation educational theories such as constructivism which emphasizes student-centered learning.

### **Conclusion and Recommendations**

The implementation of ICT in teaching and learning may face various setbacks in relation to policy, planning, infrastructure, learning content and language, capacity building and financing. ICT-enhanced education requires clearly stated goals, organization of resources and civic dedication of the concerned parties (Mikre, 2011). The findings of this study revealed the level of knowledge and competences of JHS teachers in relation to the use of ICT which also will reflect how teachers integrate ICT into teaching and learning. This is one of the areas that needs critical attention because it is obvious that only those who can use ICT will make any effort to factor it into teaching and learning. The conclusion is that majority of JHS teachers cannot integrate ICT into teaching and learning or implement it effectively due to their very insufficient or insufficient level of knowledge and skills in the use of ICT.

ICT integration in education should parallel with teacher professional development (Mikre, 2011). It is therefore recommended that government through the ministry of education (MoE) in collaboration with all stakeholders plan, program and re-train teachers to acquire the required technological and pedagogical content knowledge (TPACK) for effective integration of ICT in education.

### **Implication for Further Research**

This study did not factor in academic qualification and field of specialism of the JHS teacher; very relevant variables that can enable teacher classification to determine whether teachers' ICT proficiency depends on academic qualification and or field of specialism. This will further help to identify the categories of teachers that need critical attention for professional development and re-training programs to equip them adequately with the knowledge and competences for ICT integration into teaching and learning.

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