

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/344544382>

# Pre-service teachers' technology skills and its effects in using technology for instruction: In pursuit for quality teacher training

Article in *International Journal of Engineering Science and Technology* · September 2020

CITATIONS

0

READS

10

2 authors, including:



**Bernard Wiafe Akaadom**  
University of Cape Coast

5 PUBLICATIONS 0 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Educational Technology [View project](#)

## **Pre-service teachers' technology skills and its effects in using technology for instruction: In pursuit for quality teacher training**

**Bernard Wiafe Akaadom (PhD)**

*Department of Mathematics and ICT Education, University of Cape Coast, Cape Coast, Ghana.*

---

### **Abstract**

*The use of technology for instruction is gaining widespread recognition because educators now believe in the potency of technology and how it affects teaching and learning positively. To be able to use technology effectively for instruction, teachers must have the knowledge and technical ability to use technology for instructional delivery. The purpose of this study therefore was to investigate into pre-service teachers' technical ability to use technology and its effect for instruction. The study is located in the pragmatist paradigm which followed a mixed methods approach using a concurrent triangulation design. A stratified random sample of 417 pre-service teachers were drawn from eight teacher colleges of education as well as a purposive sample of four tutors of teaching technology related courses and four tutors handling other courses participated in the study. Four student focus groups consisting of ten students in each group also provided data qualitative data for the study. The study used semi-structured questionnaires and interview schedules to gather data. Quantitative data were analyzed statistically using relevant descriptive and inferential statistics. Qualitative data were analyzed using thematic approach. It came to light that although there are challenges pre-service teachers face in terms of access to such technologies, they still do their best to include technologies in their lessons whenever possible. It was found that pre-service teachers lack the technical skills needed to use technology effectively for classroom instruction because of the lack of technical training which is missing from the curriculum for training. Pre-service teachers are calling for more technical skills training to equip them to overcome their fears to be able to use technology for instruction. It is therefore being recommended that stakeholders of teacher education would redesign the technology curriculum to include more technical courses to help equip pre-service teachers to teach effectively with technology in the classroom.*

---

Date of Submission: 05-09-2020

Date of Acceptance: 20-09-2020

---

### **I. INTRODUCTION AND LITERATURE REVIEW**

Technology knowledge is that which pertains to conventional tools, such as books, chalk and blackboard, and more sophisticated tools which include the Internet and digital video and audio recordings (Wise, 2001). Technology knowledge does not only involve the tools highlighted above but also the skills necessary to operate individual technologies. For digital technologies, ideas and skills of operating systems and computer hardware, and the skill to use benchmark applications such as word processors, spreadsheets and e-mail is important (Glenn, 2002). According to Becta (2004), technology knowledge involves information on how to set up and disconnect peripheral devices, connect and disconnect software programs, and generate and file official papers. It has been observed that most regular technology seminars and classes concentrate on the attainment of such abilities. As technology is constantly undergoing changes, the issue of technological knowledge requires changing. For example, a lot of the instances given above such as operating systems, word processors, browsers, etc. will surely undergo changes, and may even go out of the system, with time. The capacity to learn and adjust to new technologies will still be essential. The issue of teachers' inability to integrate technology into instruction comes about as a result of several factors. It was the goal of this study to establish from pre-service teachers, how they used computers for daily classroom practice. In line with this, the researcher sought to investigate how applications such as PowerPoint presentation, the internet, CD-ROMs, social media platforms, as well as e-learning platforms were used to augment instruction both inside the classroom and outside of it. This rich information would go a long way to help supervisors and the accreditation boards to see if design of modules for training pre-service teachers is being adhered to or otherwise so that any requisite intervention can be instituted.

Technological content knowledge is the understanding concerning the approach for bringing technology and content together (Zhao, 2003). Pre-service teachers ought to comprehend, not only the content knowledge they impart, but similarly, the way in which that content knowledge can be transformed by using technology. For effective integration of technology into instruction, pre-service teachers need not know only the subject matter but also, how to use technology to deliver it.

---

The knowledge domains discussed above are very important to curriculum planners in that by identifying pre-service teachers' knowledge bases in these areas, curriculum planners and teacher educators can plan for a curriculum that will embrace an all-inclusive training. This would ensure that by the time pre-service teachers go through their training, they would be well equipped to integrate technology in their classroom.

Information Communication Technology (ICT) denotes a broad collection of equipment and applications intended for taking, storing, displaying and sharing data and information in an electronic way (Debande & Ottersten, 2004). Technology plays a number of leading roles extending from helping the work of the instructor, the student and the subject matter, to aiding more communications in a rationalized and important manner. Ordinarily, whereas teaching and learning calls for the physical attendance of the educator and the student in a designated location, modern widespread use of technology has dared educational institutions, knowledge pursuers and suppliers to change by making possible infinite and open access to education (Namdev, 2012; Ndambayaje & Orodho, 2014). Some of the novel educational accessibilities are multimedia resources, e-library, e-learning, distance learning, life-long-learning and social networking services (Ndayambaje & Orodho, 2014). The core ICT inputs are replicated in terms of infrastructure, hardware, software and support services whereas its real acceptance is characterized by fundamental skills, knowledge, approach, flexibility and community ownership (Debande & Ottersten, 2004).

There is every indication that pre-service teachers not only need pedagogical training, but also training in specific skills. Lee (2007) points out that many pre-service teachers of advanced age have not had computer education or extensive interaction with technology tools and in effect, are in dire need of technology literacy skills training to allow them to use technology in their instructional delivery. In Preston et al. (2000), pre-service teachers feel that they have not had sufficient training. Pre-service teachers ability to solve technical problems as and when they come, together with their understanding of basic processes of technology tools was found to be poor leading to frustrations emanating from the anticipation that they learn technology skills and applications on their own mostly through reading books and undocumented instances where they solve their own problems when they are confronted with one. To deal with this problem, Snoeyink and Ertmer (2001) recommend that the initial phase of training pre-service teachers must be concentrated on the fundamental operations of technological tools and usage. When this is done and pre-service teachers have developed the fundamental skills of using technology, then they can proceed to pedagogical training to prepare them for professional development and practice. In relation to this, Veen (2012) proposes that training should be separated according to pre-service teachers experience and skills in using computers. By so doing, different skills of training could be delivered according to individual needs. The researcher used a mixed method to obtain more information on the challenges pre-service teachers face regarding the incorporation of technology into their instruction. The qualitative data obtained from the sample threw more light on what they felt was happening in their training and suggested how best those challenges, in their opinion, could be addressed. It was the view of the researcher that such vital information was very critical for curriculum developers and teacher trainers to help deal with issues that pre-service teachers were confronted with when it comes to issues regarding their training.

There have been reports of lack of opportunity for pre-service teachers to use technology for instruction in their professional training. This, more or less, affects their use of technology even after their graduation and qualification to become professional teachers (Murphy & Greenwood, 2008). It has been observed that the lack of opportunity for pre-service teachers to use technology comes from fact that teacher educators in the various colleges of education themselves do not possess the know-how to use technology for instruction and as a result are incompetent to hand on those skills to trainee teachers by so doing (Simpson et al., 1999). Cuckle and Clark (2002) add that another challenge to pre-service teachers' use of technology for instruction is the lack of technological pedagogical training in teacher training institutions. They established in their study that even though pre-service teachers had suitable technology skills emanating from their everyday use of technology tools, they found it difficult to make use of these skills in using technologies for instruction. Consequently, when they had technological pedagogical training in technology, they still could not make use of the knowledge and skills learned through their training because the skills could not easily be transferred into their classroom instruction. Murphy and Greenwood (2008) reveal that the problem is compounded by a deprivation of motivation for student teachers to make suitable use of technology during teaching practice sessions. The issue of pre-service teachers' inability to inculcate technology into classroom instruction is multifaceted. The researcher investigated whether it had got to do with lack of technology facilities in schools or the lack of skills training, by using final year students in the colleges of education who had both experienced training and had the opportunity of going to the schools for teaching practice. This gave the researcher a good idea about what the real problem was and shared this information with scholars and policy makers so as to help deal with pre-service teachers' challenges regarding the use of technology in the classroom.

A genuine fear for pre-service teachers in considering integrating technology into teaching and learning is the fear of equipment or tools breaking down during lessons or possibly causing damage either to themselves or the equipment. Bradly and Russel (1997) observe a strong relationship between the fear of causing damage to

equipment and pre-service teachers' lack of confidence in using technology tools. This can in effect, affect pre-service teachers' preparedness to use technology in their classrooms. Cuban et al. (2001) note that if technical problems occur frequently each time pre-service teachers use technology tools, it limits the confidence and preparedness for its usage which tends to negatively impact on their preparedness for technology use. The study elicited responses from the sample by establishing if they are proficient in the use of common peripheral devices and how to solve routine hardware and software problems and make informed choices about technology systems, resources and services. This would inform all stakeholders about pre-service teachers' predicament and how well they can be assisted to overcome difficulties when it comes to attending to technical problems as and when they emerge.

### **Objectives of the study**

The objective of this study was to investigate into the technical abilities of pre-service teachers in the colleges of education in Ghana with regards to the use of technology in teaching and learning and how it affects their instructional delivery. It is believed that most teachers shun the use of technology for instruction for fear of hitting a technical glitch which might go unresolved as a result of their poor technical knowledge to fix technical problems themselves.

## **II. METHOD**

The sequential explanatory strategy of mixed methods data collection approach was used to allow for both quantitative and qualitative data to be collected. The use of mixed methods in the study was proposed and used on the principle of triangulation which seeks to guarantee that the researcher uses more than one measurement procedure and invariably enhances trust in findings (Creswell, 2003). This approach was characterized by the collection and analysis of quantitative data in the first phase of the research which was followed by the collection and analysis of the qualitative data in the second phase. This was done because responses from the respondents precipitated qualitative data to be collected to build on the results of the initial quantitative results. The mixing of the data occurred when the initial quantitative results informed the secondary qualitative data collection. Thus, the forms of both data though separate were connected. This strategy allowed for deeper understanding of the problem at hand.

### **Sample**

The sample for the study were final year students ( $N=417$ ) from eight colleges of education in Ghana. A simple random selection of respondents was done to ensure that the results of the study could be generalized to the population under study. Four tutors with not less than three years supervision and teaching experience were drawn for the qualitative sample through the purposive sampling procedure as participants from the eight selected colleges. They were interviewed with a semi-structured interview guide. Also, four student focus groups consisting of not less than ten students selected were interviewed with another semi-structured interview guide.

### **Data and analysis**

The data that were collected were cross-checked and cleaned to ensure that no mistakes existed in the responses and the information given was appropriate. Quantitative data was analyzed statistically by the use of descriptive statistics (Mean, Standard Deviation, Percentages and Frequencies). The in-depth interviews (IDIs) were analyzed manually. The data from the IDIs were transcribed, categorized under specific themes and used for the analysis. Researcher personally carried out all interviews to ensure that the required data were collected to help answer the research questions in the study. Again, researcher personally analyzed the interview data collected.

## **III. RESULTS**

The results for both types of data are as presented below.

**Table 1: Responses on pre-service teachers' access to, identification of varieties of technologies and use**

<b>Statement</b>	<b>SD</b>	<b>D</b>	<b>U</b>	<b>A</b>	<b>SA</b>	<b>Total</b>	<b>M</b>	<b>ST.D</b>
I am able to use different available technologies	15 (3.4)	45 (10.8)	89 (21.3)	204 (48.9)	63 (15.1)	416	3.62	.980
I use technology in my teaching to promote active learning	30 (7.2)	84 (20.1)	63 (15.1)	170 (40.8)	70 (16.8)	417 (100)	3.40	1.189
I use technology to enhance instruction	36 (8.6)	80 (19.2)	68 (16.3)	169 (40.5)	64 (15.3)	417 (100)	3.35	1.200
I use technology to improve student learning	28 (6.7)	51 (12.2)	60 (14.4)	184 (44.1)	94 (22.5)	417 (100)	3.64	1.155

I use technology in my teaching to promote problem solving on learners	32 (7.7)	56 (13.4)	67 (16.1)	186 (44.6)	75 (18.0)	416 (99.8)	3.52	1.159
I always try to use technology where possible in all my lessons	34 (8.2)	69 (16.5)	51 (12.2)	188 (45.1)	74 (17.7)	416 (100)	3.58	2.358
I use technology in my teaching to make learning more fun	34 (8.2)	78 (18.7)	72 (17.3)	178 (42.7)	54 (12.9)	416 (99.8)	3.34	1.163
I use the internet to enhance my teaching and learning	78 (18.7)	81 (19.4)	62 (14.9)	137 (32.9)	58 (13.9)	417 (100)	4.01	.977
I use e-learning platforms to promote teaching and my own learning	73 (17.5)	91 (21.8)	69 (16.5)	128 (30.7)	56 (13.4)	416 (99.8)	4.08	.973
I use computers daily for my instruction	107 (25.7)	103 (24.7)	62 (14.9)	117 (28.1)	27 (6.5)	416 (99.8)	4.06	1.023
I use Power Point for my instruction	113 (27.1)	101 (24.2)	55 (13.2)	93 (22.3)	54 (12.9)	416 (99.8)	4.08	.973
I use CD-ROMS for instructional purposes	93 (22.3)	132 (31.7)	82 (19.7)	87 (20.9)	23 (5.5)	417 (100)	3.72	1.155
I use social media platforms for teaching and learning	64 (15.3)	110 (26.4)	80 (19.2)	108 (25.9)	50 (12.0)	416 (99.8)	4.06	1.023

SD: Strongly Agree; D: Disagree; U: Uncertain; A: Agree; SA: Strongly Agree; M: Mean; ST.D: Standard Deviation ( Mean: 1 – 2.4 Low; 2.5 – 3.4 Moderate; 3.5 – 5 High)

Respondents' ability to use different technologies available had majority of them (64%, n=267) confirming to using different technologies for instruction. 57.6% (n=240) agreed to using technology to promote active learning in students, a positive indication that pre-service teachers use technology to promote learning in their students. Majority (55.8%, n=233) agreed to the use of technology in the classroom to enhance instruction. Again, majority of respondents agreed (66.6%, n=288) that they used technology to improve upon students' learning. A total of 62.6% (n=261) agreed to using technology to promote problem solving in their learners constituting the majority of respondents using technology to promote problem solving skills in learners.

In trying to integrate technology where possible in all lessons, 62.8% (n=262) agreed to that assertion. It came out that majority of pre-service teachers (55.6%, n=232) agreed to using technology in their teaching to make learning more fun for learners. The calculated mean (standard deviation) for this variable was 3.34(1.163) establishing that using technology to make learning more fun for learners was fairly high. The use of the Internet was very popular among pre-service teachers as 56.8% (n=195) affirmed using the internet as a tool enhancing teaching and learning. In all, 41.7% (n=174) rated their use of social media platforms for teaching and learning as poor with a mean(standard deviation) of 2.93(1.279) indicating a disagreement that pre-service teachers use social media platforms in teaching and learning. However, the use of e-learning platforms to enhance teaching and learning was good (44.1%, n=184) with an average score of 3.01(SD=1.329).

Responding to using computers for their daily classroom practice, a large proportion of pre-service teachers rated their daily use of computers for instruction as poor. A total of 210 (50.4%) rated their daily use of computers as poor; an indication that a significant number of respondents acknowledged infrequent use of computers. In terms of the use of specific tools and applications in instruction, 51.3% (n=214) of respondents acknowledged they were very poor at using PowerPoint to present lessons. Using CD-ROMs in teaching and learning amongst respondents was not popular. Majority of respondents (53.8%, n=225) reported that their use of CD-ROMs in teaching and learning was poor. Pre-service teachers' use of social media platforms in teaching and learning was also confirmed as poor. In all, 41.7% (n=174) rated their use of social media platforms for teaching and learning as poor, with a mean (standard deviation) of 2.93 (1.279) indicating lack of agreement on pre-service teachers' use of social media platforms in teaching and learning.

### **Qualitative results on pre-service teachers' technical skills they possess in using technology for teaching and learning**

To delve deep into the problem at hand, student focus group interviews as well as semi-structured tutor interviews were held. During the interviews, themes and sub-themes emerged on pre-service teachers' technical skills they possessed in incorporating technology into instruction. The main themes and sub-themes are presented in Table 2 below.

**Table 2: Themes and sub-themes on pre-service teachers' technology knowledge and skills they possess**

Themes	Sub-themes	Related issues
Technology Knowledge and Skills	Multimedia	Use of smartphones and digital cameras to take pictures and make audio recordings to create multimedia projects to aid instruction. TESA programme assisting non-skilled college tutors to teach with technology.
	PowerPoint Presentation	Taken as a course module to assist pre-service teachers to prepare their own presentations for instructional delivery
	Technology entry characteristics	Not easy for pre-service teachers to learn technology because of non-use of technology or not taught in senior high school. Poor technical/computer skills to solve problems. ICT tutors teach from scratch as demanded by syllabus. Experienced pre-service teachers tasked to peer tutor inexperienced ones.
	Access to technology	Limited access to technology tools, both at college and at home
	Lack of technical skills	No courses on hardware to learn about troubleshooting computers. Tutors from other departments other than ICT department lack technology and technical skills to use technology.
	Fear of students with advanced technology knowledge	Pre-service teachers entertain fears their students might be advanced in technology than they do.

#### IV. MULTIMEDIA

The data obtained from the interviews with tutors and pre-service teachers from the selected colleges revealed what pre-service teachers would do with available technologies for instruction in their respective classrooms. Tutors were asked to speak about what they knew about pre-service teachers regarding their use of technologies for instruction from their personal interactions with them. They were asked to express their opinions on whether pre-service teachers were capable of using digital cameras to capture pictures, videos and use them to create projects for instruction. From the tutors' point of view, most pre-service teachers were capable of doing this because they had picture and video-recording experience from the use of their smartphones and downloading them for various purposes. Although it was not part of the ICT syllabus, some of the selected colleges taught multimedia content because the college felt it was important for students to know this to be able to use technology for effective delivery of instruction. This is what one tutor had to say:

*Student teachers can capture videos with cameras and use the pictures for instruction because we teach them but when they go to the field, it is always a challenge for lack of facilities. In our college here, we teach them Multimedia courseware but this is not done in other colleges. This is because it does not form part of the ICT syllabus but we feel that their job after school would demand it hence the decision by the college to mount it for all its students. (T4)*

Other tutors felt the use of smartphones to capture still pictures did not guarantee the use of digital cameras by student teachers for instruction as this does not form part their ICT curriculum in the college. She had this to say:

*Generally, it may be difficult for pre-service teachers based on the curriculum we are following but specifically, we equip them by mounting a course called 'Multimedia in the classroom' where students are given projects to develop videos on teaching a particular subject and post them on YouTube for others to see. (T1)*

When pre-service teachers themselves were asked to state their opinions on this issue, they contended that they would be able to do this to some as some would not be in a position to do so. This is what the pre-service teachers had to say:

*Yes we can to some extent. E.g. A friend of mine was teaching fertilization so he went to the internet to obtain a video and showed it to the class. If there is the need to do it and resources are available, we can manage to do it. (SFG2, PS8)*

This view was expressed by most of the participants from the interviews. With all the training being offered by the colleges to aid the students to integrate technology in their teaching, they still believed not all student-teachers had mastered enough technological skills to be able to do such basic things. One pre-service teacher participant responded by saying:

*About 40% of students in colleges would be able to do use the digital camera to capture videos or pictures and use them for instructional purposes. Majority of students cannot do this. Even those capable of doing this might need some assistance especially when it comes to resizing pictures and placement issues. (SFG1, PS1)*

Some participants however, pointed out that even though their tutors were being supported by some agencies to help model technology for instruction for their (students), including multimedia, there were some challenges to this. This is what the participant had to say:

*We have the TESSA (Teacher Education in Sub-Saharan Africa) programme which helps our tutors on how to teach us to use technological tools which include multimedia concepts as well as explore our environment. Our tutors keep telling us it has been so helpful to them especially those who have the zeal to learn about technology. (SGF3 PS14)*

It was revealed that the assistance tutors got from NGOs such as TESSA, the British Council, etc. had gone a long way to equip non-tech savvy tutors to also start teaching with technology. Occasionally, tutors were invited to attend workshops that equipped them with latest trends in their professional discourse and the use of technology for instruction.

### **PowerPoint presentation**

Even with intervention programmes such as TESSA (Teacher Education in Sub-Saharan Africa) expected to help boost the way students are prepared to integrate technology into instruction, some still noted that there were time constraints, and the pressure to pass examinations did not allow student teachers to learn to design, create and implement multimedia projects let alone learn the technical skills needed to teach with technology. One categorically noted that:

*Our syllabus has been structured in such a way that students are taught so many things in one semester within a limited time. E.g. PowerPoint is a first semester course and we do teach them all the elements in it. After this, students are made to make presentations and present them in class for peer assessment. This assessment strategy helps to correct some of the petty mistakes they do on resizing, sound, animations, contrast, etc. We do the illustrations and thereafter, they also try their hands on it so they see. The only problem is that they have very limited time for practice. (T2)*

It was the view of tutors that pre-service teachers learn the rudiments of PowerPoint presentations so that if everything fails as a result of constraints where there are no other technology tools to use, they can fall on it to present lessons. They claimed PowerPoint is a useful tool for presenting lessons because they could make use of pictures and sounds for demonstrations to boost what they teach and what students learn.

### **Technology entry characteristics**

The researcher further wanted to find out how well or easy it was for pre-service teachers to learn technology and its integration into lessons. Most teachers interviewed held divergent views on this issue probably because of their experiences with pre-service teachers in their respective colleges. Given below were some of the things they said with regards to how easy or difficult pre-service teachers learnt technology.

*It is not easy for most of the student teachers who come to the colleges to be trained as teachers to learn technology because they were not taught using technology and most confess that they were never taught the subject ICT in the senior high schools so when they come to college and we use technology to teach them so they can also learn to teach with it, it makes it difficult for some of them. The good news is that they get over this with time. (T3)*

To the ICT tutors, their experience with student teachers made them to always start teaching them ICT from scratch and gradually move them from there. Because of this, they tried to identify the novices and group them with those who possessed the basics and assigned them tasks so that the novices would get some assistance and learn from their "experienced" colleagues. They believed those who come to the college with the fundamentals of ICT had acquired them from their constant interactions with gadgets for social media use. The major challenge for such students related to hardware issues. From the students' perspective, people who already knew about technology did not find it difficult learning technology at college. The problem has always been those who come to college with no pre-knowledge of technology. Some contend that teacher trainees can easily learn technology if only they receive good tuition from qualified tutors, not only in the software, but also in hardware. To them, if the colleges can get qualified resource persons to teach them both the theoretical aspects of technology and the practical, they would learn technology easily.

It was the aim of the researcher to ascertain about the technical skills of pre-service teachers needed to use technology. When equipped with the necessary technical skills, pre-service teachers would be able to attend to their own technical difficulties. Data obtained from tutors presupposed that pre-service teachers lacked the technical skills needed to use technology and where they had them, they were not enough. A tutor participant had this to say:

*Some come to college without any basics and the college system sometimes makes it even more difficult to equip pre-service teachers with technical skills to deal with problems when the need arises. (T1)*

Others were of the view that pre-service teachers possessed some technical skills but they were not enough to help them deal with technical hitches when they arose. One tutor said:

*Some teacher trainees have some technical skills but it is not enough. They need a lot more IT technical skills to be able to solve technical problems. The college system has been examination oriented so there are always time constraints for pre-service teachers to learn and acquire technical skills to solve technical*

problems. In all, I can say they possess about 40% technical skills to solve their own technical problems through their own personal experience. (T2)

Pre-service teachers felt that they do not possess technical skills enough to help them attend to technical problems when they encounter them. Most of their responses were not encouraging as they also believed that their colleges were not helping them acquire the technical skills they needed to use and solve technical problems associated with technology use. One student participant had this to say:

*For possession of technical skills to be able to use technology, we may disappoint you because we are never taught this in college. If any one of us can do anything with respect to this, it is through his/her own personal experience. If it is about what we learn about technology in college, I will say a big no. (SFG1 PS2)*

Some of the student teachers claimed that their colleges also lacked equipment to be used by tutors to help train them. According to them, in some cases, there were only five computers that were working in their computer laboratory for an average class of 44 student teachers. They stated that only a handful of them were able to solve their own technical problems and that there was not enough time for them to learn all that from college. With regards to the technical skills needed to use technology, tutors claimed that, because some of them attended computer training schools before enrolling at college for their training, they came in with advanced knowledge and they would try to identify them and ask them to assist those with minimal skills. This is what one tutor participant had to say:

*For some of them, even touching the mouse is a big problem but there are some who are more eager to learn to acquire the skills needed to work with technology. All the same, they try to do their best. (T3)*

Student participants shared the same sentiments as they felt the technical skills needed to effectively use technology for instruction was lacking. They were confident in effectively using computers but not in using the other technological tools. One student participant noted that:

*We have the basic skills needed to help us use computers and laptops. For other technology tools, we know practically nothing unless we are presented with the opportunity to learn. (SFG2, PS10)*

Pre-service teachers were of the view that there was need for more practical training through which they would gain the technical skills they needed to solve their own technical problems when they encountered them. They said sometimes the problem might just be minor but because they lacked the skills to solve it, they had to resort to technicians who charged them exorbitant fees for attending to such problems. From the discussions, they were eager to learn these skills to help them solve basic technical problems.

### **Access to technology**

Do pre-service teachers have sufficient opportunities to learn both at home and college to work with different technologies? On the whole, tutors sounded convinced that such opportunities are rare for students, especially at home. Almost all tutors interviewed claimed students had more access and opportunities to learn technology at college than at home. One tutor said:

*No, no, no; students don't have sufficient opportunities to learn technology especially at home. We shouldn't forget that some of them come from very poor homes where such tech tools are not available. E.g. I gave my students an assignment and asked them to submit them to my email one vacation and most failed to do it. Upon their return to school, they complained that there was no internet access and cafes were not available but for campus, they always have access to the internet. (T2)*

This was affirmed by the student participants who claimed that at college, they had access to the internet to browse and submit assignments online and even had access to more technological tools because they did presentations in class where they made use of the computers and projectors.

### **Lack of technical skills**

To use technology effectively in teaching and learning, there is need to be skilled in solving the minor routine problems likely to be encountered in using technology. There is need to be proficient in the use of common input and output devices where routine hardware and software problems are dealt with, as well as making informed decisions or choices about technology systems, resources and services. Participants were asked to share their experiences in this regard. Teacher educators in the ICT field were confident they could deal with problems of that nature without much difficulty, but those who were not, said they always consulted their colleagues in the ICT department for assistance whenever they came across any challenges. This is what one had to say:

*I am not an ICT guy so anytime I encounter problems like that, I consult the ICT department for assistance. (T3)*

The ICT tutors confirmed this by saying that indeed, other tutors sought their assistance anytime they ran into software and hardware difficulties. In some instances, they had to help in setting up the projector to be used in the classroom for those who wanted to use it in their lessons. This is affirmed by T4 who noted that:



*We provide such assistance and support for our tutors a lot. Perhaps it might interest you to know that we go as far as setting up projectors in the classroom for other tutors to use. We work as though we are technicians even though we are tutors just as they are. We wish the government provides qualified technicians to assist the colleges in situations such as these.*

The participating student teachers were however, optimistic that they were capable of setting up printers and other peripheral devices usually connected to the computer to get them working, and that should there be problems with them, they could solve them themselves because they deemed such problems minor problems.

*We can connect cables and get devices to work but not software and hardware problems. We are deficient in solving such problems. (SFG2 PS6)*

*We can assemble and connect devices to get them working but fixing issues associated with these gadgets would be difficult for us as we lack that kind of training. (SFG1 PS3)*

*Some of us can but not everyone. If we open the CPU of a computer, only a few of us may be able to identify the memory, hard disk, etc. For once, we tried fixing a software problem and we succeeded but we believe we can fix the minor problems and not the major ones. (SFG3 PS15)*

Tutors and pre-service teachers' understanding of the nature and operations of technology systems was probed. For the tutors in the ICT field, there were no problems with regards to this, but those with other backgrounds did not have ideas about the nature and operations of technology systems. They claimed they learnt all that as part of their training in the university before being employed to work with the colleges. With the pre-service teachers, most of them claimed they did not have ideas about technology systems and how they work. A few claimed that with the training they had from computer training schools before enrolling for college education, they had a fair idea about technology, nature and operation of technology systems. Some of them shared their experiences as follows:

*I personally have the basics from a computer training school programme I did before coming to college. Before college, I heard it was compulsory for all students to do ICT and because I had no knowledge on ICT, I decided to do this programme to give me the basics of technology training before enrolling at college. This has helped me a lot because at the computer training school, I did more than I am doing here in college. (SFG1 PS4)*

*If you are talking about into the details of it, then my answer is no but if not, I will say yes. We only know the basic ones like cold and warm booting for example. (SFG3 PS11)*

*Nature and operation of technology systems? No. All we know is that if your laptop computer can't start, it may be that viruses have taken over so you will have to re-install new windows and do away with the old windows. (SFG4 PS17)*

As and when common computer problems surge up, users, especially teachers, are expected to possess the skill to deal with them as some of these problems could come while delivering a lesson. The lesson must not end abruptly because there is a common computer problem. When participants were asked to shed more light on troubleshooting computer problems, this is what a tutor had to say:

*We, as tutors of this college responsible for teaching ICT, it is expected of us to deal with common computer problems. When we encounter any, we do all by ourselves like printer and network problems. There are no services provided for us. (T1)*

On the part of the pre-service teachers, they said it was not part of their syllabus to be taught anything hardware, so when challenges involving hardware arose, it would be difficult to deal with them owing to their deficiency in this area.

*For hardware stuffs, we didn't do any at college. We were never taught all of these like solving network problems and printer problems. Even with the software stuffs, we still think we need more training to be able to work effectively with it. (SFG2 PS9)*

Pre-service teachers indicated that it would be good to see some hardware course(s) mounted for them so as to be able to attend to the petty problems they may encounter in the course of delivering lessons.

### **Fear of students with advanced technology knowledge than pre-service teachers themselves**

Researchers have wondered if teachers need advanced technology skills in order to effectively use technology in the classroom. The students pre-service teachers teach may have advanced technology knowledge and skills than pre-service teachers so the researcher sought to find out from participants if indeed, pre-service teachers needed advanced technology skills to effectively use technology in their instruction. There were diverse opinions on this from tutors. Whereas some admitted it was important, others felt the basics they learnt in college was enough to deliver instruction using technology in the classroom.

*Student teachers indeed need technology training to be able to use technology for instruction but not necessarily advanced technology. The fundamentals are okay for successful technology use in the classroom. All*

*the same, they need to upgrade their knowledge with time because technology itself keeps changing from time to time. (T2)*

Pre-service teachers seemed to agree with their tutors that they needed advanced technology training to be able to deliver instruction using technology in the classroom. They felt the training they received from college was enough but contended that their training needed to place more emphasis on their practical training than the theoretical lessons they seemed to have been taken through.

*For me, the answer is no to this question. I say this because the basics are okay for me to teach with technology. However, there is always the need to upgrade one's knowledge to keep up with new technologies. (SFG1 PS3)*

Other pre-service teachers thought otherwise and argued that there was need to have advanced technology knowledge in the areas of fixing hardware technical problems when they arose in order not to disgrace themselves in front of the students they taught.

*I will need advanced technology knowledge because when I am using a laptop computer in a lesson and encounter any difficulty, I should be able to resolve it. I would be able to do this only if I have advanced technical knowledge so I think yes, teachers need advanced technical knowledge or else, I may end up disgracing myself in front of my students. (SFG4 PS17)*

*I think teachers need advanced technology knowledge because sometimes the students we teach in class tend to know more than the teachers who teach them so in order not to disgrace ourselves before our students, we need advanced technical knowledge and skills. (SFG2 PS6)*

Another question was, would more teachers integrate technology if they had more training on how to use technology? This question elicited a unanimous answer in the affirmative from participants, with some providing reasons to buttress their answers. This is what they had to say:

*I believe more teachers would integrate technology in lessons if they had more training in the field of using technology for instruction because some even come to me with their tablets to seek assistance on how to carry out some operations. Using technology in the classroom reduces one's work as a teacher and the understanding too would be much clearer as compared to the traditional way of delivering instruction. (T1)*

*I think so because some teachers are tech-phobia. Some cannot even print documents using a computer due to fear and sometimes, lack of knowledge on how to go about it. In my college for instance, some tutors are proposing that we organize computer training sessions for them. (T4)*

Pre-service teachers contributed to this by saying that indeed, more teachers would integrate technology in their lessons after receiving more training on technology integration including technical skills training provided facilities were available.

## **V. DISCUSSION**

It is generally believed that pre-service teachers, with a strong technology applications background, tend to experience greater success with technology integration once they have good pedagogical and content knowledge foundations.

Pre-service teachers in this study reported limited access to technology tools both at home and at college with poor technical skills to solve technical problems in the classroom. This might have accounted for their poor use of social media platforms to enhance their learning. One common explanation for teachers' negative attitudes to technology and its use is the deficiency of knowledge and experience regarding their technical ability. The regular use of technology by pre-service teachers boosts their confidence and gives them the urge to integrate technology into instruction. Positive attitudes toward technology use are linked to teachers' proficiencies (Summers, 1990). The persistent use of technology for instruction in the classroom by pre-service teachers would boost their ability for technology use in instruction. Cox et al. (2000) state that pre-service teachers who use technology resources regularly in their classroom show high levels of confidence in using technology and develop a positive attitude towards it. The study found that pre-service teachers were able to set-up and disconnect computers and their peripheral devices. According to Becta (2004), technology knowledge involves information on how to set-up and disconnect peripheral devices, install and uninstall software programs, and generate and file official papers. This study found that pre-service teachers are able to set-up and disconnect computers in order to get them to function to be used for teaching and learning.

Another important finding from this study was with poor technical skills by pre-service teachers owing to the limited access to technology tools both at home and college. As revealed by some tutor participants, some pre-service teachers shun using technology for instruction because of lack of technical skills. This confirms Eteokleous' (2008) finding that generally, teachers are presumed to be reluctant and just not willing to use technology once they lack the skills to do so. A number of researchers (e.g. Fogleman et al., 2011; Hernans et al., 2008; Pinto, 2005) are of the view that pre-service teachers' beliefs regarding teaching and learning impact their accommodation and predisposition to technology use in the classroom. Teacher educators strongly believe that the integration of technology into teaching and learning will transform the profession, bringing more

meaning to classroom instruction than it has been in the past. This, they believe, can be done by making amendments to pre-service teachers' professional training programme. A major finding of this study was the poor knowledge of technology which pre-service teachers see as an obstruction to technology integration in instruction. This agrees with Lee (1997) who points out that many pre-service teachers needed technology and technical skills training to enable them use technology effectively in the classroom. It is important to understand that in order to integrate technology into pre-service teachers' professional training, teacher educators need to be well equipped to be able to feel confident in using technology for instruction themselves (Wang & Woo, 2007). Unfortunately, most teacher educators were not technology savvy which inhibited their use of technology for instruction. It is necessary that pre-service teachers develop both positive attitudes and sufficient technology knowledge and skills for effective technology integration into instruction. Most scholars (e.g. Barolli & Servanni, 2009; Chai, Koh & Tsai, 2010; Gee, 2005) believe that for pre-service teachers to achieve the goals of effectively integrating technology into instruction, their technology education must include fundamental computer training and technical ability (Enochsson & Rizza, 2009). This, it is believed, will enhance the quality of instruction and the urge to use technology for instruction. It is essential to recognize that in order to integrate technology in teacher training institutions, pre-service teachers need to be equipped to feel positive in using technologies. However, in this study, it came to light that pre-service teachers' knowledge of technology integration and technical abilities were poor, thus, calling for more technology skills training to improve their technology use in the classroom. This finding affirms Newhouse (2002) finding that many pre-service teachers lack knowledge and skills to use technology and because of this they are not enthused or motivated to use technology for instruction. In developing countries mostly, research has reported that pre-service teachers' lack of technology knowledge and skills is a major hindrance to their recognition and approval of technology (Al-Alwani, 2005; Almohaissin, 2006). Most often, pre-service teachers' failure to use technology for instruction is attributed to lack of skills. A worldwide survey of 26 countries by Pelgrum (2001) found that teachers' scarce knowledge and skills is a severe hindrance to utilizing technology in primary and secondary schools. Castro-Sanchez and Aleman (2011) argue that technologies offer new educational opportunities and with diverse resources afforded by the internet, knowledge can be obtained from videos, audio recordings and visual representations and lead to transformation in teaching and learning to be more student-centered. Therefore, pre-service teachers must be trained to become technologically inclined to meet the 21<sup>st</sup> century teacher technology demands for effective technology integration into instruction. Prensky (2001a; 2001b) advocates technology inclined teachers to take over the teaching profession to rid the system of the challenge of using technologies to present instruction. This helps to bring more meaning to classroom instruction where learners benefit a lot from the instruction and can lead to improved performance in class (NetDay, 2006; Rideout et al., 2005). It is most likely that teachers' reluctance to use technology for instruction is as a result of the lack of its knowledge and skills on their part. Thus, equipping pre-service teachers with the required knowledge and skills can lead them to create the opportunity to improve the prospects of students so that they search for knowledge that is different from the usual traditional methods. To bring this into fruition, expertise in using technologies becomes an essential prerequisite.

## **VI. CONCLUSION AND RECOMMENDATION(S)**

There were no courses on hardware to enable pre-service teachers to learn troubleshooting which could help them solve their own problems when they encountered any. Pre-service teachers' knowledge of technology integration was poor and more technology training was required to improve their use of technology for classroom instruction. Novices struggled to learn technology and needed more time to practice the use of technology for instruction. In order to achieve quality education, teacher preparation should place great emphasis in training teachers who are able to integrate technology in teaching and learning by designing programmes that would call for more practical skills training for pre-service teachers. Technology courses taken by pre-service teachers should include troubleshooting at least. This would help pre-service teachers learn basic troubleshooting skills which deter them from incorporating technology into instruction and help build their confidence in using technology for instruction in the classroom.

## **REFERENCES**

- [1]. Al-Alwani, A. E. S. (2005). *Barriers to Integrating Information Technology in Saudi Arabia Science Education*. Doctoral dissertation, Thesis. Kansas: University of Kansas.
- [2]. Almohaissin, I. (2006). Introducing computers into Saudi Arabia secondary school science teaching: Some problems and possible solutions. *Unpublished paper*.
- [3]. Barolli, S. & Servanni, B. (2009). Faculty integration of technology in teacher preparation: Outcomes of a development model. *Technology, Pedagogy and Education*, 17(1), 17-28.
- [4]. Becta (2004). A Review of the Research Literature on Barriers to the Uptake of ICT by Teachers. Becta. [www.becta.org.uk/page\\_documents/research/barriers.pdf](http://www.becta.org.uk/page_documents/research/barriers.pdf). Retrieved March 16, 2007.
- [5]. Bradley, G. & Russell, G. (1997). Computer experience, school support and computer anxieties. *Educational Psychology*, 17(3), 267-284.

- [6]. Castro Sánchez, J. J. & Alemán, E. C., 2011. Teachers' opinion survey on the use of ICT tools to support attendance-based teaching. *Journal Computers and Education*, 6, 11-915.
- [7]. Chai, C. S., Koh, J. H. L. & Tsai, C. C. (2010). Facilitating Preservice Teachers' Development of Technological, Pedagogical, and Content Knowledge (TPACK). *Educational Technology & Society*, 13(4), 63-73.
- [8]. Cox, M. J., Cox, K. & Preston, C. (2000). *What factors support or prevent teachers from using ICT in their classrooms?.* Cairn: Cairn Press.
- Creswell, J. (2003). *Research design: Qualitative, quantitative and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: SAGE Publications.
- [9]. Cuban, L., Kirkpatrick, H. & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal*, 38(4), 813-834.
- [10]. Cuckle, P. & Clarke, S. (2002). Mentoring student-teachers in schools: views, practices and access to ICT. *Journal of Computer Assisted Learning*, 18, 330-340
- [11]. Debande, O. & Ottersten, E. K. (2004). Information and Communication Technologies. *Higher Education Management and Policy*, 16(2), 31-61.
- Eteokleous, N. (2008). Evaluating computer technology integration in a centralized school system. *Computers & Education*, 51(2), 669-686.
- [12]. Fogleman, J., McNeill, K. L. & Krajcik, J. (2011). Examining the effect of teachers' adaptations of a middle school science inquiry-oriented curriculum unit on student learning. *Journal of Research in Science Teaching*, 48(2), 149-169.
- Ge, J. P. (2005). *An introduction to discourse analysis: Theory and method* (2nd ed.). New York: Routledge.
- [13]. Glen, F. (1992). *Survey of ICT and Education in Africa: A Summary Report, Based on 53 Country Surveys*. Washington, DC: InfoDev / World Bank. Retrieved March 24, 2010, from: <http://www.infodev.org/en/Publication.353.html>
- [14]. Hermans, R., Tondeur, J., van Braak, J. & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers & Education*, 51(4), 1499-1509.
- [15]. Lee, E. (1997). *Conceptualizing pedagogical content knowledge from the perspective of experienced secondary science teachers*. Science Education. Unpublished doctoral dissertation. : Austin: University of Texas: Austin, TX.
- [16]. Lee, S. J. (2007). The relations between the student-teacher trust relationship and school success in the case of Korean middle schools. *Educational Studies*, 33(2), 209-216.
- [17]. Murphy C. & Greenwood L (2008) Effective integration of information and communications technology in teacher education. *Journal of Information Technology Education*, 7(3):413-429
- [18]. Namdev, D. (2012). ICT and Web Technology Based Innovations in Education Sector. *Turkish Online Journal of Distance Education*, 13(4), 256-268.
- [19]. Ndayambaje, I. & Orodho, J. A. (2014). *Information Communication Technology Penetration and its Impact on Education: Lessons of Experience from Selected African Countries of Ghana, Kenya and Rwanda*. Thousand Oaks CA: Sage.
- [20]. NetDay. 2006. NetDay's 2005 speak up event for teachers and students: Highlights from national findings, [www.netday.org/SPEAKUP/pdfs/NetDay\\_2005\\_Highlights.pdf](http://www.netday.org/SPEAKUP/pdfs/NetDay_2005_Highlights.pdf) (accessed Nov. 5, 2006).
- [21]. Newhouse, P. (2002). *Literature review: The impact of ICT on learning and teaching*, Perth, Western Australia: Department of Education.
- [22]. Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & education*, 37(2), 163-178. Pinto, 2005
- [23]. Prensky, M. (2001a). Digital natives, digital immigrants part 1. *On the Horizon*, 9(5), 1-6.
- [24]. Prensky, M. (2001b). Listen to the natives. *Educational Leadership*, 63(4), 213 - 234.
- [25]. Preston, C., Cox, M. J. & Cox, K.M.J. (2000). *What factors support or prevent teachers from using ICT in their classrooms?.* Amsterdam: IEA.
- [26]. Rideout, V. J., Foehr, U. G. & Roberts, D. F. (2005). *Generation M: Media in the lives of 8-18-year-olds*. Washington, DC: A Kaiser Family Foundation Report. Retrieved May 28, 2007, from: <http://www.kff.org/entmedia/index.cfm>
- [27]. Simpson, M., Payne, F., Munro, R., Hughes, S. & Lynch, E. (1999). *ICT in initial teacher education in Scotland*. London: Compass Books.
- [28]. Snoeyink, R. & Ertmer, P. A. (2001). Thrust into technology: How veteran teachers respond. *Journal of Educational Technology Systems*, 30(1), 85-111.
- [29]. Summers, M. (1990). New student teachers and computers: An investigation of experiences and feelings. *Educational Review*, 42(3), 261-271.
- [30]. Veen, J. T. (2012). The learning effects of computer simulations in science education. *Computers & Education*, 58(1), 136-153.
- [31]. Wang, Q. & Woo, H. L. (2007). Systematic planning for ICT integration in topic learning. *Educational Technology & Society*, 10(1), 148-156.
- [32]. Wise, A. E. (2001). Standards in the new millennium: Where we are, where we're headed. *Journal of Teacher Education*, 52(3), 244-255.
- [33]. Zhao, Y. (Ed.). (2003). *What should teachers know about technology?: Perspectives and Practices* (Vol. 2). Amsterdam: IEA.

Bernard Wiafe Akaadom (PhD). " Pre-service teachers' technology skills and its effects in using technology for instruction: In pursuit for quality teacher training." *International Journal of Engineering and Science*, vol. 10, no. 09, 2020, pp. 18-28.