

# Impact of Emerging Technologies on Teacher Education: Experiences of Teacher-Trainees

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## Abstract

Over the years UEW have made advances to strategize for the integration of Information Communication Technology (ICT) across its curriculum. This strategy stipulates that every registered first year student takes a compulsory ICT course. The contents of this course includes: Basic Computer/Technology Operations and Concepts; Personal and Professional Use of Technology and Application of Technology in Instruction. However, recently through a partnership with Partnership for Higher Education in Africa (PHEA) in conjunction with South African Institute for Distance Education (SAIDE), UEW has embarked on innovative uses of ICT such as a blended learning model, which combines face-to-face lecture with online learning activities as the preferred model for teaching and learning. This study used a blend of quantitative and qualitative methods to collect empirical data. The quantitative data was analysed using simple means and standard deviation. Responses from the qualitative data were analysed under themes. Findings from the study showed that teacher-trainees' received technical support to use the online learning management system (LMS). The main findings of the study showed that: 1. A number of teacher-trainees' access technology for academic and non-academic activities; 2. Use of the social media is popular among teacher-trainees' however, using it to support learning is still a challenge; 3. A number of teacher-trainees' lack confidence in using technology tools, because of their low technology skills. The lessons drawn from the opportunities and challenges faced by students in the utilization of technology tools could be used to formulate ideas in the deployment of ICT tools and facilities. It is expected that this study will provide useful information to provoke a revolution in technology use in education, learning and research. The results could be a useful reference for the design of ICT curriculum for Teacher Training programmes.

**Keywords:** Emerging technologies, teacher-trainees, pedagogical practices, MOODLE, social media

## 1. Introduction

There is pervasive unanimity that technology is now an unavoidable and vital part of our daily life, work and home experiences. Subsequently, the call for schools to move to a more technologically integrated approach to teaching and learning has been resonating among departments of education in various countries. Advancement of technology initiated by digital revolution through technology innovations has caused a paradigm shift in the way we do things of which the entire landscape of education is included. The computer has changed information and data handling in all fields of endeavour with the Internet and the numerous networks within it (Asangansi, Adejoro, Farri, and Makinde, 2008). Akbulut (2010) says the current workplace practices urge individuals to have the ability to use Information Communication Technology (ICT) with efficiency and confidence. More so, ICTs are crucial for lifelong learning and awaits educators to equip trainees' with the relevant experiences before gaining employment.

Irrespective of the quantity and quality of technology placed in classrooms, the crucial point to how those tools are used is the teacher. Thus teachers must have the competence and the right attitude towards technology. However, Hoque, Razak, and Zohora (2012) believe that education system tries to inculcate ICTs to enable teachers and students gain access to knowledge. They further believe that teaching and learning cannot happen like the analogy of a spoon feeding knowledge at a given time. Thus, ICTs have a huge role in helping teachers and students to attain the desired knowledge.

According to Zhou, Zhang, and Li (2011) students do not necessarily understand how their use of technology affects their literacy or habits of learning. And that, incorporating more technology into teaching and learning does not go far enough in ensuring that graduating teacher education students are equipped to deal with the future and social change. Moreover, both pre- and in-service teachers need to be specifically trained in order to integrate ICTs in their teaching. Yusuf and Balogun (2011) said that merely having ICTs in schools will not guarantee their effective use.

Like other countries, the government of Ghana having realized the value of ICTs in education and in order to guide the practice of using technology in schools, the government through the Ministry of Education Youth & Sports (MOYES) in 2003 developed the ICT for accelerated development (ICT4AD) draft policy framework document to regulate technology use in education. This policy framework among other things seeks to highlight the significance of incorporating ICT into the national curriculum at all levels of the education sector. Following a recommendation from the National Education Review Committee Report (Anamuah-Mensah, 2003), a new reform that seeks to have ICT as a core subject across all levels was finally implemented in September 2007.

## 2. Emerging technologies in Education

Emerging technologies according to Bozalek (2011) are those technologies which are 'likely to have a large impact on teaching, learning, or creative inquiry on learners or those technologies which are on the rise'. The podcasts, blogs and e-books which are part of it have been shown to be useful to education. Specifically podcasts are seen as particularly useful because of their relative low cost and ease of use. Bozalek cites Van 'T Hooft (2009) as saying that mobility expands learning across space and time and opens many opportunities for learning that is neither sequential nor consistent. Sloan (2006) opined that emerging technologies represent a new paradigm that at first grows on the edge in relative obscurity and often seems to be of no threat or even of little value to users of the sustaining technology. Bozalek continues to say that emerging technologies in education can be used in innovative ways to address issues of inequity and social exclusion.

Recent developments in digital technologies, especially web 2.0 tools such as blogs, wikis and social media, and mobile devices such as phones and tablets, have given the end user, much more control over access to and the creation and sharing of information and knowledge. Digital technology empower learners, innovative instructors are also finding ways to harness this media to increase motivation of learners through relevant activities (Nord, 2013). According to Hoque, Razak, and Zohora (2012) integrating ICT in teacher training is high on the educational reform agenda of both developed and developing countries. For developing countries, ICT can be seen as a way to merge and even leapfrog into a globalizing, technological world. Yet in practice the use of ICT for teaching practice is limited at best. Much research is therefore done on factors influencing or constraining the use of ICT for teaching practice.

Uses of ICT in pedagogical activities are widespread in the education system. Teachers use computer software to create lesson plans, PowerPoint presentations, and use smart boards for interactive lessons. Hoque, Razak, and Zohora (2012) argue that ICT in education are described with the following functions:

- *ICT as object by referring learning about ICT;*
- *ICT as an "assisting tool" while making assignments, collecting data and documentation, communicating and conducting research;*
- *ICT as a medium for teaching and learning; and*
- *ICT as a tool for organisation and management in schools*

These four functions are of primary importance in the educational systems.

A study conducted by Al-Senaidi and Gawande (2013) at the Sultan Qaboos University used interviews, focus groups, and document analysis to study the factors that affect the adoption of technology among faculty members of the Sultanate of Oman. The conclusion from this study showed that though ICT in Omani higher education institutions has grown rapidly over the past decade, its use is still at the infantile stage. The findings also showed that the traditional approach to teaching had a negative on ICT uses at the university and as a result of that the university needs to help its faculty members improve ICT skills. Individual differences on ICT uses and skills by faculty members were identified. However, the ICT skills are not being automatically transformed into the instructional processes. Al-Senaidi and Gawande acknowledged the fact that today's faculty members are much more proficient in the use of ICT than in the past. This is due largely to the fact that ICT has permeated the modern society and the university.

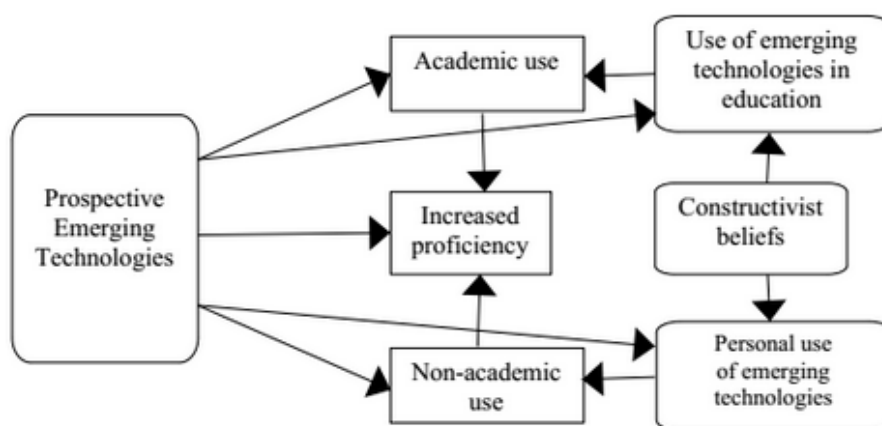
Asangansi, Adejoro, Farri, and Makinde (2008) used quantitative methods to find out the extent to which doctors in a Nigerian Teaching Hospital use computers and the Internet. Their study highlights the level to which medical practitioners use technology to manage patients and records of patients'. Their analysis showed that 62.1% of the respondents used the word processor, 95.9% surfing the Internet, the study reported that 66.9% of the respondents knew how to make slides for presentations. The percentages reported by Asangansi et al to be using technology to support their work are highly significant. Interestingly a smaller number of the respondents knew how to actually use basic statistical software applications and that had resulted in only 39.3% of the respondents who were able to publish research papers. Though trainee doctors used technology, the study did not indicate whether or not there is a policy framework that enjoins doctor trainees to study a mandatory technology course as part of their academic programme. Wighting, (2006) reports that the classroom is a microcosm of society, and that technology is having an increasing impact in schools. Wighting (p 371) concluded that information is available in far greater quantities than ever before, and the means to access and share it with others is unprecedented.

Though there is a growing literature on ICT integration in education, few studies have focused specifically on the personal experiences of teacher-trainees. This study contributes to the general body of knowledge in both theory and practice in teacher education. Findings from this study contribute to the development of evidence based policies in ICT intervention.

## 3. Theoretical Framework

The phenomenon of technology integration has affected all facets of human endeavour of which education is included. The theory behind this study is the activity theory, which was originally developed by Leontiev from

the works of Vygotsky and extended by Engestrom (Hashim and Jones, 2007). This theory is justified because it considers the issues and implications for human-computer interactions (HCI). It supports general research and combines active participation with monitoring of developmental changes of the population under study. With teacher-trainees actively exploring technology in their study, they perfectly fit into this theory. More so the theory supports general research and combines active participation of the population under study. Wilson (2014) concludes that the theory helps to differentiate between internal and external activities by emphasising on human activities through mediated tools. There is collaboration among teacher-trainees as students use technology to interact with content to search for information to produce individual or joint assignments and presentations. Tools are created and transformed during activities which lead to the development of a particular culture. The use of tools is an accumulation and transmission of social knowledge. Tool use influences the nature of external behaviour and also the mental functioning of individuals.



**Figure 1** Model of personal experiences of teacher-trainees use of emerging technologies

In the school setting, students use technology for academic and non-academic activities. Figure 1 shows a diagrammatic view of how students interact with technologies. Considering the dynamic approach of instructors, teacher-trainees are actively engaged in using technology for academic and non-academic activities. It is estimated that students will gain greater proficiency in the use of various technologies.

#### 4. Research Problem

University of Education, Winneba (UEW) established as the tertiary component of the 1987 educational reform by PNDC Law 322, with a mandate to train graduate teachers for all levels and disciplines of the education system in Ghana. To achieve this objective, UEW has through its strategic policies invested in procurement and setting up of ICT labs. UEW's ICT policy includes strategies that address the problem of low ICT literacy among its students. This strategy stipulates that every registered first year student takes a compulsory course in ICT. The contents of this course includes: Basic Computer/Technology Operations and Concepts; Personal and Professional Use of Technology and Application of Technology in Instruction. However, recently through a partnership with Partnership for Higher Education in Africa (PHEA) in conjunction with South African Institute for Distance Education (SAIDE), UEW has embarked on innovative uses of ICT such as a blended learning model, which combines face-to-face lecture with online learning activities as the preferred model for teaching and learning. To achieve this objective, UEW has deployed a learning management system (LMS) using Modular Object-Oriented Dynamic Learning Environment (MOODLE). Courses across several departments have been mounted on the MOODLE platform for students to access online. This novel approach to academic work is a new experience to teacher-trainees'.

The teacher-trainees throughout their studies are expected to interact with technology from registration of courses, checking of results online to engaging on online activities for academic purposes only (file attachment, quiz, uploading assignment etc). Students are encouraged to do group assignments, group projects and presentations by using technology to interact with content. Through the study of the compulsory ICT course it is expected that teacher-trainees will acquire technology literacy skills. This study seeks to find out how teacher-trainees are experiencing emerging technologies during their enrolment for their professional development programme. It also seeks to find out the technology tools and devices teacher-trainees have access to. It is expected that the findings will have implications for professional teacher development training.

## 5. Research questions

The following research questions guided the study:

- 1) *What technologies do students have access to?*
- 2) *What experiences do teacher-trainees' encounter with emerging technologies during their professional development?*

## 6. Methodology

Respondents used for this study were a range of teacher-trainees across various departments and levels with all of them offering teacher education based courses. Using a blend of quantitative and qualitative methods empirical evidence was collected from teacher-trainees through an online survey (Creswell and Garrett, 2008; Phillips, 2009). The quantitative survey involved the use of close-ended and open-ended Likert scale type questions. The qualitative data involved the use of focus-group discussions with an average of 7 participants in each group, where respondents had the opportunity to express their thoughts about their personal experiences with the use of emerging technologies.

### 6.1. Data Analysis Framework

The tools used in the data collection produced both quantitative and qualitative data, which data was analysed under themes to conform to the research questions. Participants for the study were drawn from students pursuing teacher education programmes at UEW. Responses from the focus-group discussions were assigned serial numbers TT1 –TT21 where TT represents teacher-trainee.

## 7. Data Analysis & Presentation

Research question 1:

*What technologies do students have access to?*

The analysis of the qualitative data as presented in Table 1 showed that 65.2% of students have access to desktop computer. It is rather interesting that only 35.4 % of the participants had access to laptops. It is understandable that 2.4% of the students owned tablet as the tablet is an expensive device. However, for as much as 92.1% of the students to have access to Microsoft office word, it was quite surprising that only 37.4% of the respondents said they have access to the Excel spreadsheet. The implication of this is that not many of the students are aware that Microsoft Office suite includes PowerPoint, Excel spreadsheet applications.

Table 1:  
*Students Access to Technologies and Applications*

<i>Emerging Technologies in Education</i>	<i>% Responses</i>
Computer	65.2
Laptop	35.4
Tablet	2.4
Mobile phones	95.1
Radio	46.2
Social media (Facebook, WhatsApp)	83.2
Microsoft Office Word	92.1
Excel spreadsheet	37.4
Presentation application	43.3
Digital camera	8.2
Camcorder	1.2
Skype	4.7
Twitter	2.1

The open-ended questions provided the balance in the responses provided by the respondents. For instance, it became evident that, the number of respondents who said they did not have access to the excel spreadsheet actually did not realize that the excel spreadsheet and the PowerPoint presentation applications are all part of the Microsoft software suite. The respondents also explained that they use the social media to communicate; such as, to catch up on the latest events in town. Thus, they are able to follow what is trendy in town but surprisingly not much was done to use it to support academic work.

Table 2:  
*Personal Experiences*

<i>Themes</i>	<i>% Responses</i>
Challenges (software's , technologies)	64.3
Communication (chatting, exchange information)	83.2
Entertainment (music, movies, games, football)	54.3
Ownership (laptop, desktop)	44.2
Access to technology (devices and applications)	79.1
Internet search (browsing, surfing)	62.1
Studies (support learning)	77.8

Research Question 2:

*What experiences do teacher-trainees' encounter with emerging technologies during their professional development?*

The study showed that teacher-trainees have been using various technologies and applications during their studies. These included applications they used to produce assignments. Some of the respondents said that:

*TT1: "Students today are benefiting from the use of technology in the classroom. Teachers are using software programs to help students improve upon underdeveloped skills in a variety of content areas."*

*TT2: "I use WhatsApp for sharing information and entertaining news with family members and other people around."*

*TT3: "I also use WhatsApp to share information with my friends and also to share entertaining news"*

*TT4: "The first time that I used the MOODLE to post a comment to the chat room was interesting. Initially I was scared, but when I saw the lecturers' picture and that of my mates in the chat room I became relaxed"*

Certainly technology has made significant impact on the learning practices of the modern day learner. Data in Figure 2 showed that learners are interacting with several technologies. Learners are required to do some activities and also submit assignments or post comments to journal activities hence the data showed that teacher-trainees' use the MOODLE for academic activities. Social media is very popular as a lot of the teacher-trainees' use it. It is not surprising that social media is popular, a lot of the students own smartphones which they use to access social media applications. This affirms the argument made by Mahmood (2009) that ICT use by students has expanded to Internet, e-mail, chat, entertainment just to mention a few.

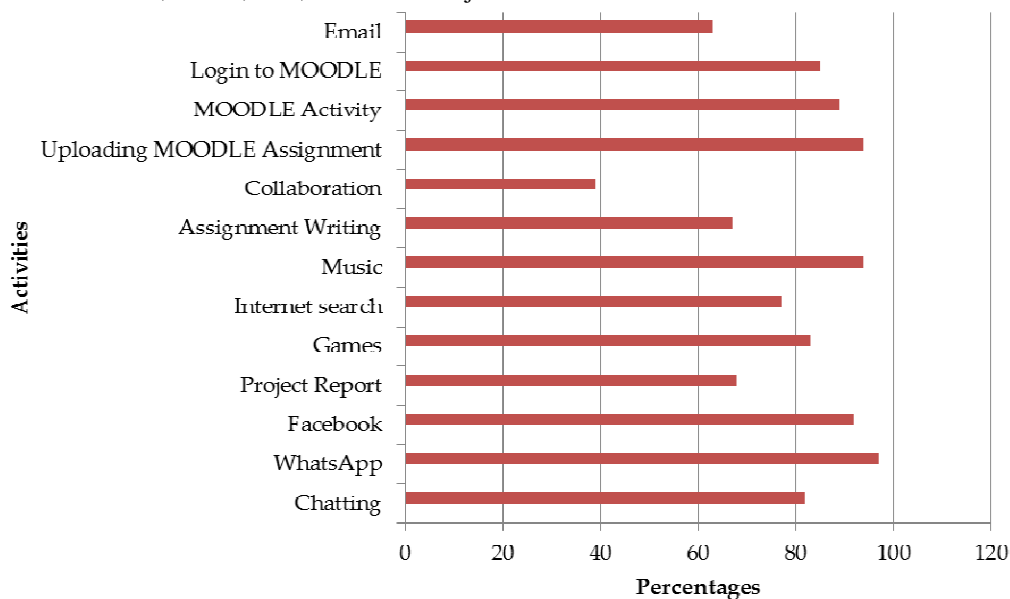


Figure 2: *Students Experiences with Emerging technologies*

## 8. Discussion of Findings

Given the exploratory nature of the experiences of teacher-trainees in this study, emphasis was placed on reporting the personal experiences of teacher-trainees use of emerging technologies, with a focus on percent responses to close-ended questions and the open-ended questions. Analysis of the findings from the data revealed interesting responses from the teacher-trainees. One central factor from the study was that teacher-trainees have had some interactions with technology and have exploited and benefited from a collection of new technologies in education.

Personal experiences of teacher-trainees' included learning to use both software applications and digital devices. Some of the applications as shown in Fig 2 included learning management system (LMS) and social media tools. With the deployment of courses on the LMS, teacher-trainees' create accounts to log in to do their assignments. Course outline/manuals and assignment submission deadlines are indicated on the LMS. It is therefore the responsibility of learners to abide by the set deadlines. The following were identified from the responses: access to technology; ownership of technology; communication; use of social media; entertainment and collaboration.

The use of various technologies helped to change the perception of teacher-trainees to the business of teaching and learning. For example a teacher-trainee participant in the study responded that:

*TT5: "New technologies are reshaping the nature of knowledge mobilization, dissemination, and use in many fields, including education. The following are some of the emerging technologies I have encountered: blogs, podcasts, wikis, oral history, online studies, social networking, virtual worlds and games in education"*

*TT6: "For my class, we have setup a group WhatsApp and Facebook accounts where we post messages. If there is any activity we use it do share information and also provide information for group activity and individual project work"*

Another participant commenting on the personal experiences provided this statement:

*TT7: "Technology is no substitute for an inspiring teacher. However, on-line materials are far more available. Using the "textbook plus classroom" approach, the places where learning can occur are limited. On the other hand, a wireless laptop has access to the teacher's course material and the entire Internet almost anywhere. I can even study on MOODLE while lecturers are on strike. Interestingly the first time I heard about the MOODLE, I was sort of not comfortable but after a while I can say that I am extremely comfortable with the use of the MOODLE for my courses".*

Another teacher-trainee responded by saying that:

*TT8: "I have also experienced that technology allows the tables to be turned. Instead of teaching (push), students can be given projects that require them to learn (pull) the necessary material themselves. I have seen first-hand how students cannot wait to get out of regular classes to go to the afterschool robotics project"*

Furthermore, another participant responded that:

*TT9: "Students today gather information through a wide variety of technology, like smart phones, iPods, tablets, etc."*

Below are extracts from the personal experiences of teacher-trainees:

*TT10: "The reason why I can confidently say that I have gained enough knowledge in this course and that I will be able to demonstrate the knowledge is that I can now design a website which can manage a course for a school. It can also serve as an online portal of information to online students. I can also design an educational website to help in teaching"*

Another teacher-trainee participant responded by saying that:

*TT11: "We have already known the internet, videos, and CDs but I prefer an engaging lecture over the use of the latest technological tools in teaching. I want to listen to a professor who is engaging, intellectually stimulating and who delivers the content"*

Findings from the data suggest that teacher-trainees' have access to collaborative tools, social media, Internet and mobile devices. The study agrees with the study of Wighting (2006, p372) which suggest that technology has a significant effect on student outcomes when compared with traditional instruction. The responses from the participants clearly brought forth the various technology literacy backgrounds of the participants. Nevertheless, it

also showed that the strategy adopted by UEW embedding technology into education seems to be yielding positive results.

## 9. Conclusions & Recommendations

A lot of studies have been carried out on ICT integration the world over. Most of these studies have focused on technology use in the classroom and barriers to technology integration. However, this study focused on the personal experiences of teacher-trainees at UEW. Each student is obliged to study a mandatory ICT course and with a lot of courses being mounted on the MOODLE. As students study the mandatory ICT course, and also interact with technology as well as face-to-face session, it is expected that students will experience a different approach to learning. The mandatory ICT course is to serve as the platform to develop the integration literacy among teacher-trainees during the formative periods of their teacher professional development. This study was significant in terms of theory, policy and practice:

- Theoretical significance: The study supports Vygotsky's learning theory. The theory used is justified as outcomes can be measured in terms of use, performance and confidence level. The significant issue here is that instructors are not involved in teacher-trainees use of technologies to support academic work. Teacher-trainees use various technologies available to interact with content and come up with solutions to a problem.
- Policy significance: Institutional policy on compulsory ICT course situates itself well into the national policy. The study showed that teacher-trainees' gained technology literacy skills from the mandatory ICT course. It allowed the shy and reserved students to do independent work and also interact with content as well as their colleagues and their instructors through technology.
- Practical significance: The respondents reported that they acquired new ICT skills and different knowledge from their assignments, projects and group activities. Some of these which are not limited to but include: exploring software, creating multimedia tools that can support teaching, designing instructional website, WebQuest, podcast and using content based software. Some of these are the use of the PowerPoint to create animated teaching tool.

Though teacher-trainees responded positively about their personal involvement with diverse technologies and tools, the author recommends that the current policy should be looked at holistically. If we want practicing teachers to use technology daily and in all aspects of their teaching then, technology should be infused in all their courses and it should also run throughout the years of their study.

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