Integrating ICTs into the Teaching process: Issues in Pedagogical Practices in Teacher Education

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Abstract

Traditional teaching methods have been used in teaching and learning since the advent of formal education. However, their limitations in different circumstances vary depending on student and instructor needs, where they are and who they are. This study looks at the issues and implications of integrating ICTs into teacher education with a focus on instructors' pedagogical practices. This study used a blend of qualitative and quantitative methods to collect empirical data from instructors of teacher education institutions in Ghana. Using stratified and convenience sampling, 16 instructors were interviewed whiles 100 closed-ended self-answering questionnaires were administered to the instructors of which 75 were returned. The quantitative data was analysed using simple means, frequencies, standard deviation, and cross-tabulation. Responses to the open-ended questions were analysed according to themes. Findings from the study showed a substantial difference of technology usage in teaching and level of technology proficiency among instructors. The main findings of the study are: 1. In spite of the huge investment made by stakeholders in education, technology use and literacy level among instructors is still low; 2. Some instructors used technology to support their pedagogical practices; 3. A number of the instructors were inept and lacked innovative ideas to use technology; 4. Some instructors still depend heavily on the Victorian methods of teaching; 5. Some of the instructors encourage students to use technology to do group work. The lessons drawn from the study could be used to formulate ideas in the deployment of ICT tools and facilities. Efforts should be made to provide continuous training for practicing teachers. It is hoped that this study will provide information to support teacher's pedagogical practices. The results could be a useful reference for the design of ICT curriculum for Teacher Training programmes.

Keywords: Pedagogical practices, ICT integration, teacher education, qualitative data, cross-tabulation

Introduction

Information Communication and Technologies (ICTs) often spoken of in a particular context such as ICT in education, health care, sports, commerce and others [1] provide the opportunity for educational institutions and other organizations to harness and use technology to complement and support the teaching and learning process. According to [1] ICTs are useful in numerous instances as they facilitate the development of various aspects of the society such as knowledge management, acquisition of knowledge, business, communication, entertainment, commerce among others. The past decade has witnessed a fundamental change in the way people communicate as well as do business. The new technologies have the potential to change the face of education: where people learn; how learning is delivered; the role of the teacher in the teaching process and the responsibilities of the learner in the learning process. This has placed educational systems under increasing pressure to use ICTs to teach students the knowledge and skills they need in the 21st century.

However, the challenges confronting educational systems of today is how to transform the existing curriculum so as to position and to provide students with the needed skills to fit into and also to function effectively in this dynamic, information rich, and continuously changing environment. In addition [2] [1] believe that ICTs provide a motley of tools that may help in transforming the present often isolated, teacher-

centred and text-based classroom activities into rich, student-focused multimedia and interactive knowledge environments. Furthermore, in order to meet these challenges, institutions of learning must accept the new technologies and appropriate ICT tools for learning. [3] also say that for institutions of learning to actually make an impact in the teaching and learning process then they must move towards the objective of transforming the traditional paradigm of teaching and learning.

The idea of integrating ICT into teaching and learning creates a concern between pedagogy and technology. To master ICT skills is not the only concern, but using the acquired skills to improve teaching and learning is of major concern. The infusion of ICT in pedagogy should be such that it tends to enhance learning through a new learner-centred culture. It also fosters enquiry and exploration, promotes collaboration, motivates and engages learners. The use of ICTs does not only allow the move from reproductive model of teaching and learning to an independent, autonomous learning model that promotes initiation, creativity and critical thinking with independent research.

Teachers are required to use technology in lesson delivery, it is important that technology becomes part of thier training. There is the need to examine the relation between techniques, knowledge and set of instructors' skills which is related to the application of ICT use in the classroom. As computer studies (integral part of ICT courses) have became part of the national curriculum, the pedagogical practices of the teacher in the classroom becomes affected.

Integrating ICTs in Education

Technology is a means for improving education and not an end in itself. [4] argues that integrating ICT into teaching and learning is not a new concept. The opinion of [5] is that computer integration in the classroom is the application of technology to assist, enhance, and extend student knowledge. However, ICT in education means more than just teaching students how to use computers. Thus, ICT should also be used to promote information literacy, with the capacity to access, use and appraise material from various sources in order to enhance learning events to solve difficulties and to craft awareness.

Technology literacy is totally different from being able to integrate technology into teaching to enhance learning. In other words, being "digitally fluent" means not only knowing how to use the technological tools, but how to construct things of significance with those technological tools. Teachers do not only need to learn about technology, but they need to learn how to use technology to enhance their learners' understanding and critical thinking skills. Enhancing basic information and communication skills like speaking, reading and writing, should rather be the focus of using ICT in education, but not simply being ICT literate.

[2] as saying that ICT usage in Kenya is limited to computer literacy training just like most developing countries. Omwenga further contends that the present ICT curriculum merely deals with 'teaching and learning about computers' and not how computers can be used to transform the teaching and learning in our schools. A wide range of learning technologies should be selected and incorporated into educational programmes and that technology integration should consider learning pedagogy, the pattern of student use of ICT, and the extent of use in teaching and learning programmes. Omwenga also says that e-learning is an example of the use of these ICT supported teaching and learning methods whose use in educational institutions is gaining momentum with the passage of time.

The opinion of [6] is that teachers acknowledge ICT's as tools for building knowledge mediated by collaborative activities that are relevant for participation in future society and guide towards an authentic problem. Teachers collaborating among themselves is important as it provides the platform to contribute to the pedagogical uses of ICT's in the classroom. Basically when we talk about technology integration in education, we literally and usually mean computer technology. However, we need to remember that the blackboard and chalk are also technologies, as much as charts models and animations, simulations videos are all technologies that can be used to enhance teaching. We can also say that technology is merely a method of doing something.

[7] said teacher education is neither mere pedagogy nor acquisition of training qualification. Globalization and shift to a knowledge based economy require that educational institutions develop in the individual the ability to transfer information into knowledge and to apply the knowledge in dynamic cross-cultural contexts. [8] suggested that teacher preparation provides fundamental experiences for the use of

technology. They concluded that most research examined attitudes as well as ability or use of IT, but rarely looked at all three. [8] further suggested that though most teacher-trainees possess essential ICT knowledge and skills as well as positive attitudes they do not appear to be ready in using ICT in their teaching. [6] perceive some failures such as lack of diversity of the teaching needs, short period, large groups, and inadequate computers for participants, among others. Generally, teachers accept being trained on using technologies through courses, seminars and workshops

According to [9] most nations have limited resources for teacher training they must adopt cost-effective strategies by making judicious use of resources. Jung further says that a well-designed teacher training program is essential to meet the demand of today's teachers who want to learn how to use ICT effectively for their teaching. This study is to find out about how technology has affected the pedagogical practices of teacher trainers. [10] says that merely learning ICT skills is not enough but using the ICT skills to improve the teaching and learning is the key for pedagogy-technology integration. But the question is how we can combine these two. As it is now the situation seems to be left to the discretion of the teacher concerned. Thus an innovative teacher will use images, play video of real time situation or even animate objects to explain critical concepts. Practicing teachers must use whatever knowledge they gained from ICT integration courses. This can be attained by incorporating these practices within the classroom and avoid the risk of losing the acquired knowledge.

Research Problem

There has been an increased interest in implementing computing initiatives in Ghanaian educational institutions recently. Several initiatives were in existence prior to the launch of the 2007 educational reforms. Some of these initiatives included the NEPAD e-schools project, the Global Teenage Project, not to mention the support by some old students associations to various schools among others. To achieve the goal of making ICT useful in education, the government of Ghana through the Ministry of Education launched an educational reform to include ICTs as a core subject across the curriculum at all levels. To make this a reality, a policy framework of Ghana Information and Communication Technology for Accelerated Development policy (ICT4AD) [11] was initiated following a recommendation from the National Education Review Committee Report [12]. Both documents highlight the significance of incorporating ICT into the school curriculum at all levels. The launch of the educational reform regulated and streamlined the use of ICTs in education.

The implementation of the reform saw an increase in setting up of computer laboratories and influx of computers to educational institutions in Ghana requiring teachers to use ICT devices as a tool to support teaching. The reform also brought about a paradigm shift in pedagogical practices of teachers, the focus of shifting from the teacher-centred approach to leaner-centred appraoch. Teachers were trained through several training initiatives such as seminars workshops and through professional development training programmes. The expectation from these training initiatives was to create awareness and to initial changes to pedagogical practices of teachers. However, the situation on the ground appears to be diferent. This study seeks to find out issues that affect pedagogical practices in teacher education in Ghana with regards to identify the technologies that instructors have access to and use to support their teaching.

ICT Education Framework

Realising the potential benefits of ICT in education, the government of Ghana instituted a policy framework to increase the presence of ICT in education. The benchmark for the Ghana governments ICT policy seeks to among other things use ICT as a tool to enhance teaching and learning. It also seeks to expand access to education through the distance education programme. As a result of that learners at all levels of education in Ghana are required to learn about ICT as a course and also use ICT to support personal learning. It was envisaged that the ICT policy in teacher training will raise the competency standards through a combination of ICT skills with pedagogical innovations, curriculum and the school as an organisation bring teacher education into alignment with national development goals.

Consequently, these three approaches correspond to alternative national policy goals and visions for the future of education. Together they provide a developmental trajectory by which education reform supports

increasingly sophisticated ways of developing a country's economy and society: from technology uptake, to a high performance workforce, to a knowledge economy and information society. Through these approaches, a country's students and ultimately its citizens and workforce acquire increasingly sophisticated skills needed to support economic, social, cultural, and environmental development, as well as an improved standard of living.

The framework is also aimed at teachers' ability to use ICT skills and resources to improve their teaching, increase collaboration with colleagues, and perhaps ultimately to become innovation leaders in their institutions through power leaders.

Research Questions
1) *What technologies do instructors use to support their teaching?*
2) *In what ways do technologies affect the pedagogical practices of instructors?*

Data Collection

The data was collected from teacher educators from teacher education Universities in Ghana and two College of Education. The respondents for this study were selected from various departments. Stratified sampling was used to help isolate a group in order to have a fair representation of the population. The study used stratified sampling to isolate the respondents and Likert-type scale self-answering questionnaire administered to the instructors. To analyze the data from the questionnaire, Statistical Package for the Social Sciences (SPSS) Software Version 16.0 was used. The data captured included instructors computer literacy level, age, sex, access to computers among others. The interview session collected data on personal experiences and the changes technologies have on instructors' pedagogical practices. Data presented in Table 1 shows a cross-tabulation of respondents' sex and age. The age and sex were collected to help understand the phenomenal usage by the 'digital natives' (<40years) from the 'digital migrants' (>40years).

Table 1
Cross-Tabulation of Respondents age & sex

Age	Male	Female	Total
20-29 years	2	13	15
30-39 years	17	7	24
40-49 years	19	5	24
50-59 years	8	4	12
Total	46	29	75

Data Analysis and Results

The results of this study are presented in six parts: (a) sex distribution according to age; (b) collaborative and social-media accounts; (c) technology tools instructors access; (d) applications and technologies instructors use; (e) instructors use of social-media and collaborative tools and (f) impact of technology on pedagogical practices

Discussion of Findings

The purpose of research question one in this study is to find out the various technologies instructors integrate in their teaching practices. The study revealed that: 1. A number of instructors have access to, and understand the value of technology; 2. Some instructors use project based assessment and as such encourage students' to do group and individual projects for assessment; 3. Some instructors still favour the Victorian methods of teaching. Analysis of results from research question two revealed that technology affects the pedagogical practices of instructors. The age distribution of instructors with respect to their access to computers is presented in table 2. The age range 20-29 years recorded 4 respondents as saying they do not have access to computers. It is interesting that 4 respondents from the 'digital natives' actually do not access

computers in their institution or have access to computers elsewhere. Statistics of instructors computer use is presented in Table 3. According to the data, 82.7% of the respondents (n = 62) use the computer for research work as compared to lesson delivery which recorded 52% (n = 39). Furthermore, 42.7% (n = 32) use the computer for entertainment purposes whiles 61.3% (n = 46) of the participants use the computer to create documents.

Table 2
Cross-Tabulation of Age and Access to Computer

	Age Range (Years)				
Access	*20-29*	*30-39*	*40-49*	*50-59*	*Total*
Yes	11	24	24	12	71
No	4	0	0	0	4
Total	15	24	24	12	75

Table 3
Instructors Computer Use

Activity	*Yes*	*%*	*No*	*%*
Entertainment	32	42.7	43	57.3
Research	62	82.7	13	17.3
Communication	41	54.7	34	45.3
Creating documents	46	61.3	29	38.7
Lesson delivery	39	52.0	36	48.0
Other	1	1.3	74	98.7

Research question 1: What technologies do instructors use to support their teaching?

The data presented in table 4 shows that 85.7% (n = 65) of the respondents have e-mail accounts. A further 62.7% (n = 47) of the respondents have Facebook accounts, with 49.3% (n = 37) of the respondents having twitter accounts. Wikis and blogging recorded very low patronage. This is understandable in the sense that, they are not popular applications to the respondents. Though instructors indicated they have accounts for twitter and skype the numbers in table 4 suggest that they are not favoured applications.

Even though 85.7% of the respondents indicated that they have e-mail accounts in Table 4, only 36% (n = 27) of the respondents actually used it to support teaching as seen in Table 5. Interestingly 40% (n = 30) and 33.3% (n = 25) of the participants use educational CDs and videos to support teaching. It is also surprising that 10.7% (n = 8) of the respondents use Facebook to support teaching, although 62.7% of the participants reported that thy have Facebook accounts as shown in Table 4. The implication of the responses clearly shows that instructors are not taking advantage of the popularity of the social media to support teaching. For example the e-mail and the Facebook can be used to do collaborative learning and also to share information on teaching and also to support teaching. Creating a mailing list will be beneficial to a larger group of instructors and students.

Table 4
Collaborative and Social Media Tools Instructors Have Accounts In

Items	*Number of respondents*	*%*
E-mail	65	85.7
Twitter	9	12.0
Skype	27	36.0
Blog	2	2.7
Wiki	4	5.3
Facebook	47	62.7

WhatsApp	37	49.3
Others	9	12.0

Table 5
Tools and Applications Instructors use to Support Teaching

Item	Number of respondents	%
E-mail	27	36.0
Twitter	1	1.3
Skype	3	4.0
Facebook	8	10.7
Videos	25	33.3
Educational CDs	30	40.0
Learning/Course Management System	14	18.7
WhatsApp	5	6.7
Podcast	3	4.0

Research question 2: In what ways do technologies affect the pedagogical practices of instructors?

To find in-depth information from participants, a sample of the instructors were interviewed. The interview transcriptions provoked interesting mixed reactions from participants. Though some of the respondents expressed their desire to use technology others were totally against the use of technology to support teaching. A number of the participants responded that technology has affected their teaching methods. Below are some of the responses from participants.

P1: It has affected my methodology in the sense that I have stopped giving notes. I give students the opportunity to do project work using technology; I present my lesson using PowerPoint.

P2: I use a wide range of technologies such as laptop, projector, scanner, photocopier, mobile phone.

P3: Sometimes I play a movie and I ask them to make notes from the movie.

P4: I teach integrated science so sometimes I use animation to support a concept I want to teach. I support my teaching with movies, pictures, and PowerPoint presentations ……….

Responses from the participants in the interview showed that though not prevalent a number of instructors are varying their methods by using technology. The question that has not been clearly answered is why some of the instructors are changing their pedagogical practices while others are stuck to the old ways of doing things? Can that be attributed to attitudinal or lack of technical support?

In another development participants were asked whether students were encouraged to use technology in academic work. These were some of the responses:

P5: The students are not serious so I don't give them work that will involve the use of the Internet.

P6: No I do not because if I give them the chance the will instead be watching pornographic movies on the Internet …….

P7: Oh for my course I give students project work to be done as a group. Students present their findings to the whole class using PowerPoint. Students are allowed to use materials from the

Internet, which includes text pictures etc. ………..

The responses show that some of the instructors do not trust their students to use technology for positive results. This response raises the issue of implementation of technology user policy. Do we make our students responsible for their activities? Do we teach to discriminate information on the Internet? Or how do we make sure that students do the right thing? Have we also put down checks and balances in the use of technology for assignments? These questions could provide the basis for further research.

The evidence from some of the participants (e.g. **P1, P3** etc) supports the study carried out by [2] which cites Muriithi (2005) as saying that 75% of teachers in secondary schools in Kenya would encourage learning by discovery with an almost similar number supporting learning through group work as well as supporting learning through project work.

Even though there is evidence from the data to show that technology has significant implications on teachers' pedagogical practices. For example a participant in the interview indicated that learners make their own notes by reviewing a movie clip. As learners engage in knowledge creation, they take control of their learning pace and what they acquire, which is consistent with constructivist approach to learning. Learners also develop the skills of teamwork as they learn to collaborate to come up with group assignments. Primarily the transition from teacher-centeredness to learner-centeredness is not fully certain as a result of some misconceptions on the part of instructors, empirical evidence from the data further shows that a number of the instructors' understand the impact of technology in teaching.

Conclusion & Recommendations

The issue of ICT integration in education is a comprehensive process of applying technology to the curriculum to enhance teaching and learning. The success of the integration depends not only on the availability of technology, but also heavily on the pedagogical changes. There are other factors which include access time, professional development, attitude, leadership, and probably evaluation. These issues have a great impact on the effectiveness of ICT integration [13].

Empirical evidence from the data provides a clear dichotomy about the use of technology by educators in teacher training. There is a clear significant difference in teacher's perceptions of their preparedness to apply ICT in teaching. It is also obvious, that the orientation of the government of Ghana towards ICT education as a course of study and a prerequisite of pedagogical training of teachers seems to be in the right direction, since it can reinforce the feeling of competence, and raise the confidence level of teachers.

The following recommendations are made for stakeholders in education. The recommendations which the researchers made from the findings include the following:

1. If we want practicing teachers to use technology to support their teaching, then technology use should be integrated in every course and at every level. This will help build the confidence and develop the creative abilities among teacher-trainees'
2. There is the need for regular in-service training for teacher educators and practicing teachers to go update their technology literacy skills.
3. Teacher education institutions should include technology training as part of their curriculum from the first year to the final year. Technology integration should be subject based and not as an isolated ICT or educational technology course.
4. A study is conducted on practicing professional teachers' use of technology in the classroom.

Teacher-trainees and teacher educators have a significant role to play in the sustained application of ICT in schools. If we want trainees to use ICT to support their teaching then it is important that their training is well grounded in technology integration. If we continue to teach them about computer technology without encouraging them to create learning models with technology then, the bold trainees will create their own models and use it to support their training. The implication is that such models will not be structured, thus creating unstructured teaching models being used by various professional teachers at different locations.

It is the hope of the researchers that this paper will inspire some new thinking into ICT integration and the pedagogical practices expected from practicing teachers.

References

[1] Wilson, K. B., Ayebi-Arthur, K., & Tenkorang, E. Y. (2011, March). ICT integration in Teacher Education-A study of University of Education, Winneba. (C. Anthony-Kruege, Ed.) Journal of Science and Mathematics Education, 15(1), 138-150. doi:ED538533

[2] Omwenga, E. I. (2006). Pedagogical issues and e-learning cases: integrating ICTs into teaching and learning process. School of Computing and Informatics, 1-11. Retrieved February 15, 2014

[3] Attwell, G., & Hughes, J. (2010, September). Pedagogic approaches to using technology for learning – literature review. Skills for Life long Learning, Pontydysgu. Lifelong Learning-UK. Retrieved February 16, 2014, from http://webarchive.nationalarchives.gov.uk/20110414152025/http:/www.lluk.org/wp-content/uploads/2011/01/Pedagogical-appraches-for-using-technology-literature-review-january-11-FINAL.pdf

[4] Bhasin, B. (2012). Integration of information and communication technologies in enhancing teaching and learning. Contemporary Educational Technology, 3(2), 130-140. doi:324

[5] Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. Innovations in Education and Teaching International, 45(4), 411–419. doi:10.1080/14703290802377307

[6] Manzuoli, C. H., & Cifuentes, Y. S. (2013). Computing education competence in Higher Education: challenges for teachers. American Journal of Educational Research, 1(9), 406-412. doi:10.12691/education-1-9-9

[7] Joy, N., & Ishikaku, E. C. (2012). Integration of Information and Communication Technology (ICT) in Teacher Education for Capacity Building. Journal of Education and Practice, 3(10), 68-74. Retrieved August 11, 2014, from www.iiste.org

[8] Gao, P., Tan, S. C., Wong, F. L., Choy, D., & Wang, L. (2010). Nurturing preservice teachers' understanding of technology-enhanced pedagogy through reflection. In C. Steel, M. Keppell, P. Gerbic, & S. Housego (Ed.), Curriculum, technology & transformation for an unknown future. Proceedings ascilite Sydney 2010, (pp. 353-363). Retrieved July 16, 2014, http://ascilite.org.au/conferences/sydney10/procs/Gao-full.pdf

[9] Jung, I. (2005). ICT pedagogy integration in teacher training: application cases worldwide. Educational Technology & Society, 8(2), 94-101.

[10] Majumdar, S. (2006). Emerging trends in ICT for education & training. Retrieved May 31, 2014

[11] Ghana Government. (2003). The Ghana ICT for accelerated development (ICT4AD) Draft policy. Ministry of Communication. Accra: Ghana Government. Retrieved August 22, 2014, from http://www.ict.gov.gh

[12] Anamuah-Mensah, J. (2003). Meeting the challenges of education in the twenty-first century. Educational Reforms Commission Report, Ministry of Education Youth & Sports, Accra. Retrieved August 22, 2014

[13] Wang, Q., & Woo, H. L. (2007). Systematic Planning for ICT Integration in Topic Learning. International Forum of Educational Technology & Society (IFETS), 10(1), 148-156. Retrieved June 3, 2014