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Pre-service teachers' perspectives on the use of information and communication technology: A case study of Berekum College of education

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Abstract
Information and Communication Technology (ICT) is very essential in everyday life of many people worldwide. Information and communication technology (ICT) have become an important tool in today's information age, making a remarkable influence on the lives of individuals around the globe. Information and Communication Technologies (ICTs) have become within a very short time, one of the basic building blocks of modern society. The study investigated pre-service teachers' perspectives on the use of ICT in Berekum College of Education. The study examined the types of technologies pre-service teachers' use. The study determined the ways pre-service teachers' use technologies to support their learning. Convenient sampling and random sampling techniques were used to select the sample size of thirty (30) pre-service teachers from the college. The study revealed that all the participants got access to technology on campus. Again, all the participants did say the accessible technologies have been very helpful. In addition, the study indicated that respondents use the accessible technologies for research, emailing, assignment writing, presentation and chatting. However, the findings of this study will enable policy formulators to be clear with the ICT policy and its direction of implementation with the necessary guidelines so that the implementation agents like Ghana Education Service, Ministry of Finance among others can help to make a reality since competency in ICT is the modern way of acquiring critical skills and knowledge effective and efficient economic development.

Keywords: ICT, perspectives, college of education, pre-service teachers

Introduction

Modern technologies such as Computer and Telecommunications technologies have been the most remarkable and transformative of the technologies emerging over the past 30 years (Afari-Kumah & Tanye, 2009) [1]. Afari-Kumah and Tanye further argued that the emergence and convergence of these technologies have been termed Information and Communication Technology (ICT), a term sometimes synonymously used with Information Technology (IT). IT is defined as the combination of computer technology with telecommunications technology. According to Wilson, Ayebi-Arthur and Tenkorang (2011) [34] the term includes computer hardware and digital/analogue devices and software applications. According to Daniels (2012) [10], Information and Communication Technologies (ICTs) have become within a very short time, one of the basic building blocks of modern society. However, there appears to be a misconception that ICTs generally refers to 'computers and computing related activities'. This is certainly not the case, although computers and their application play an important role in modern information management, other technologies and/or systems also comprise of the phenomenon that is commonly regarded as ICTs. Pelgrum and Law (2003) [28] stated that near the end of the 1980s, the term 'computers' was replaced by 'IT' (information technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term 'ICT' (information and communication technology) around 1992, when electronic mail started to become available to the general public (Pelgrum & Law, 2003) [28]. Information and Communication Technology (ICT) has gone through innovations and transformed our society that has totally changed the way people think, work and live (Grabe, 2007) [17]. As part of this, schools and other educational institutions which are supposed to prepare students to live in "a knowledge society" need to consider ICT integration in their curriculum (Ghavifekr, Afshari, & Amla Selleh, 2012) [16]. In conjunction with preparing students for the current digital era, teachers are seen as the key players in using ICT in their daily classrooms. This is due to the capability of ICT in providing dynamic and proactive teaching-learning environment (Arnseth & Hatlevik, 2012) [13]. There is no doubt that technology in this contemporary society is used more and more widely, especially for the purpose of teaching and learning. This is because modern technology offers many tools that can be used in classrooms to improve teaching and learning quality (Bruniges, 2003; Lefebvre, Deaudelin, & Loiselle, 2006; Bingimlas, 2009) [8, 24, 6]. Worldwide research has shown that ICT can lead to improve students' learning as well as better pedagogical practices. ICT can help students to develop their skills, boost up their motivation and widen their knowledge and information (Grabe & Grabe, 2007) [17]. However, the study examines pre-service teachers'

perspectives on the use of Information and Communication Technology in the Bono region of Ghana, specifically Berekum College of Education.

Statement of the Problem

Information and Communication Technology (ICT) is very essential in everyday life of many people worldwide. Information and communication technologies (ICT) have become an important tool in today's information age, making a remarkable influence on the lives of individuals around the globe. This outcome is very vital in education. ICT infrastructure is a key which determines a successful implementation of the ICT programmes. Therefore, ICT is accessible only if the infrastructures are available. In the previous years, Ghana's education stakeholders have engaged in several projects to initiate (ICTs) into the Ghanaian education setting; especially at the basic, senior high and tertiary levels. The government of Ghana in association with Non-Governmental Organizations (NGO), philanthropists/benefactors and Parent-Teacher Associations (PTAs) built ICT resource centres to help the teaching and learning of ICT compulsory to all senior high school students as well as the colleges of education. Furthermore, while ICT tools and devices are made accessible to students, several pre-service teachers encounter challenges in the use of these technologies in their everyday lives on campus.

In the review of relevant literature, it was found that plethora studies on the use of ICT in basic and senior high schools are abundant. However, very few studies have investigated pre-service teachers' perspectives on the use of Information and Communication Technology. It is, therefore, imperative for a very systematic empirical study on pre-service teachers' perspectives on the use of Information and Communication Technology in the Bono region of Ghana, specifically Berekum College of Education. This study proposes to fill this knowledge gap. Researching into pre-service teachers' perspectives on the use of Information and Communication Technology in Ghana is very important to the fact that the results could provide practical and realistic ways of improving the teaching and learning of ICT and promote the general use of ICT in all endeavours.

Purpose of the Study

The main purpose of the study is to investigate pre-service teachers' perspectives on the use of ICT in Berekum College of Education. Specifically, the study sought to:

- To examine the types of technologies pre-service teachers' use.
- To assess the ways pre-service teachers' use technologies to support their learning.

Research Questions

The following questions were formulated to guide the study:

- What types of technologies do pre-service teachers' use?
- In what ways do pre-service teachers' use technologies to support their learning?

Significance of the Study

The study is to examine pre-service teachers' perspectives on the use of Information and Communication Technology in the Bono region of Ghana. The importance of this study is to improve knowledge about ICT. Again, the study will be relevant to policy makers in collaboration with stakeholders in education to know the importance of ICT to students as well as pre-service teachers thereby making the infrastructures available to them. Furthermore, the study is directed towards stakeholders such as principals, lecturers, school administrators and others in organizing academic programs to provide pre-service teachers with activities that require creative use of ICT devices and tools to enhance their skills in the use of computers as an instructional tool for supporting teaching and learning.

Literature review

Policy on ICT Education in Ghana

The government of Ghana is dedicated to the transformation of the agro-based economy of Ghana into an information rich and knowledge – based economy and society using the tools of information and Communication Technology (ICT). The government of Ghana has acknowledged the need for ICT training and education in the schools, colleges and universities and the development of the education system as a whole. The introduction of ICT into education will result in developing new possibilities for learners and teachers to actively involve in new ways of information acquisition and analysis; ICT will improve access to education and enhance the quality of education delivery on equitable basis. The government is therefore committed to a comprehensive programme of rapid development and utilization of ICT within the education sector to transform the educational system and thereby enhance the lives of our people. It is the government's desire that through the development of ICT, in education, the culture and practice of traditional memory-based learning will be transmuted to education that stimulates thinking and creativity necessary to meet the challenges of the 21st century. Given the magnitude of the task ahead, the government enjoins both the public and private sector to join hands to ensure that our children receive high quality teaching and learning (MOE, 2015) [26].

Policy Context

The ICT policy statement of the Ministry on ICT is an embodied version of the ultimate goal to transform educational system. It is designed to provide a picture guide of the process of the deployment and exploitation of ICTs within the framework of the national ICT division.

The Ministry of Education and its agencies such as Ghana Education Service at the Regional and District levels are responsible for the administration and implementation of the provision and the delivery of education and training at all levels within the education system of Ghana. They also have a responsibility to systematically promote the development of all approved and recognized competing individuals, groups and nations as well as providing realization and pleasure and improve on the health and general well-being of Ghanaians. The Digital Divide is essentially the extent of disparity between those that have and those who do not have access to information and associated technologies. It also borders on collective knowledge generation, local content development for a domestic knowledge economy required for promoting online transactional capacity for consumers, business and government sectors. It is expected that an enabling environment needs to be created by government corporate agencies civil societies and individuals to facilitate access and capacity building as well as full exploitation of the potentials of ICT. The policy document is to provide a policy direction for what needs to be done and how it is intended to be done. It also relates to programmes of implementation of the outlined policy actions. However, the policy document is informed by the following considerations;
The dawn of information age, characterized by ICT, is making information and knowledge-based economies more globally competitive;

- New areas of comparative advantage, the country must develop, utilize and exploit ICT to bridge the poverty and development gap. This is because poverty is not lack of money in people's pockets but lack of knowledge in educational gap.
- For the labour market, environment, ICT user and professional skills are required and the education sector which has the responsibility of developing the human resource base for national development is therefore required to put in place the necessary resource mechanisms to ensure that the human resource outputs of education can be suitably absorbed.
- ICT will also help Ghana achieve its goals set within the wider developmental objectives as defined by the Ghana Poverty Reduction Strategy, the Education Strategic Plan, Ghana Government white paper on the report of the Education Reform Review Committee, the Science Technology Policy among others.
- The digital age has brought with it a number of security issues that the policy needs to address.
- The need to enhance efficiency and effectiveness of the management and administration of education institutions.

After having considered the above factors and many more, the committee which was set up in 2003 to outline an ICT education policy for the country finalized its worked and launched the policy in 2007. One can see from the above that the committee was launched in 2003 and finally finished its work in 2007. This delay was due to three (3) main reasons. The first was the complete lack of coordination among the various stake holders and the ministries. Secondly, the other ministries were not actively involved in the policy formulation process. Thirdly, there was lack of human resource capacity to devise and implement an appropriate ICT policy for Ghana. The policy which was finally launched as stated above in 2007 through the help of several agencies including Global e-Schools and Communities Initiative (GeSCI), gave the objectives of the policy as:

- Ensure that students have ICT literacy skills before coming out of each level of education
- Provide guidelines for integrating ICT tools in all leve1s of education
- Provide means of standardizing ICT resources for all schools
- Facilitate training of teachers and students in ICT
- Determine the type and level of ICT needed by schools for teaching and administration purposes
- Promote ICT as a learning tool in the school curriculum at all levels

Vision Statement of the Policy
Formation of well balance individuals with the requisite knowledge, skills, values aptitudes and attitudes to become functional and productive citizens who are adaptable to the demands of a fast-changing world driven by modern Science and Technology to the extent that they are capable of using ICT's confidently and creatively to achieve personal goals for full participation in the global and knowledge economy.

Mission Statement
To provide relevant education to all Ghanaian at all levels to enable them to acquire skills that will assist them to develop their potential to be productive, to facilitate poverty reduction, promote socio-economic growth and national development and to formulate and implement policies to accelerate development for the welfare of Ghanaians for national interaction and international recognition. Finally, the researchers are of the view that a more logical national ICT in education policy be provided and that it should be set around identified objectives, priorities and time-frames for ICT utilization in Ghanaian schools and colleges.

Structural Dimensions of ICT in Education
It is also important that all aspects of its structural dimension comprising

- Thematic Issues
- Content & Curriculum
- Technical and Operational

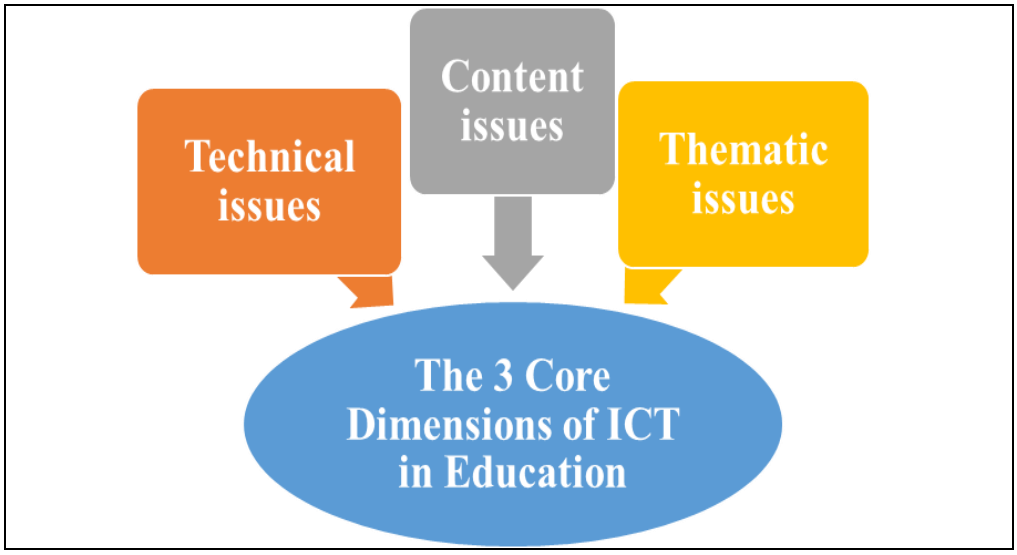

Fig 1: Core dimensions of ICT in Education

They are considered and given appropriate emphasis for the policy interventions to be effective. Due to the fact that all of these dimensions have an interlocking relationship with each other that cannot be ignored, it is important to recognize that the source, type and nature of the relationship encountered between the dimensions can result in varying impact, that in turn can also affect the level of success or failure of (the specific aspects of) the policy, when implemented.

Concept of Information and Communication Technology

Mastering information technology and understanding basic skills and concepts of ICT are now highly regarded by many countries (Daniels, 2012; Rampersad, 2011) [10, 11]. ICT has been increasing at an amazing rate in instruction among teachers. The need for development of ICTs has been a great significance to all mankind. Whether one is talking on the phone, sending an e-mail, going to the bank, using a library, listening to sports coverage on the radio, watching the news on television, working in an office or in the field etc involve the use of ICT. Information and Communications technology is a shorthand for the computers, software, networks, satellite links and related systems that allow people to access, analyze, create, exchange and use data, information and knowledge in ways that were almost imaginable (Association of African Universities, 2000) [4]. The prevalence and rapid development of ICTs has transformed human society from the information technology age to the knowledge age (Galbreath, 2000) [15].

In recent times ICTs have become an important part of most organizations and businesses of which education is part (Bingimlas, 2009) [6]. Bingimlas further argued that ICT play various roles in the learning processes. According to Wang and Woo (2007) [32] the use of ICT in education is not a new concept as it may be as old as radios or televisions technologies. However, the rapid development of technologies, such as web technologies, ICT integration has progressively attracted the attention of instructors. Jung (2005) [22] said that ICTs are innovative technologies that have provided new possibilities to the teaching profession, and at the same time have placed more demands on teachers to learn how to use these new technologies in their teaching.

According to Oye, Iahad and Ab.Rahim (2012) [27] ICTs can also be used to enhance and support distance learning and that it is considered to be the digital application equipment to all aspects of education. There has been an abundance of positive claims in recent years about the potential of ICT in transforming higher education in the twenty-first century (Wang, 2009) [25]. ICT has the power to radically change classroom practice.

A study conducted by Mahmood (2009) [25] on medical students at University of the Punjab showed that students used the computer for the following social media, collaboration, homework, entertainment among others. Mahmood's work also showed that students used computers more for word processing, presentations, data analysis, and emails. According to Mahmood, entry-level students conducted electronic literature searches more frequently than the outgoing classes.

Dukić, Dukić and Kozina (2012) [13] indicated that continuous ICT evolution and implementation are forcing universities and colleges to respond to trends that are capable of transforming society into a knowledge economy. Habib, Johannesen, and Øgrim (2014) [18] also argued that trends in higher education point toward an increase in technology-enhanced education. Furthermore, they cite (Yoo & Huang, 2011) [35] as saying that technology acceptance has been identified as a cultural issue that plays a major role in today's learning experience.

Oye, Iahad, and Ab.Rahim (2012) [27] asserted that knowledge and ICT usage improves human capacity in all aspects of life in general. This includes fields of human endeavour such as business transactions, industrial operations, and education. Oye, Iahad, and Ab.Rahim argued that failure to use technology by many academics in lesson delivery should be of great concern. Again, Oye, Iahad, and Ab.Rahim believed that the delivery of technology services in a higher educational environment has implications for leadership to meet the reform

agenda. In addition to improving administrative efficiencies, leadership must create an environment that appropriately supports technological innovation. The opinion of Bladergroen, *et al*. (2012) [7] is that though educators have received training in the use of technology to support teaching, most still felt that the training they received was not adequate. Choudhary and Choudhary (2013) [9] also said that innovative teaching strategies are vital in higher education courses if it is to engage and motivate the newer tech-savvy generation. Choudhary and Choudhary believe that leaders of higher educational institutions are faced with the challenge to position their institutions for the twenty-first century. In order to achieve that, they should recognize the need to do away with practices that are inconsistent with the needs and demands of a knowledge society.

Methodology

Study design

The study employed a descriptive cross-sectional design. The descriptive cross-sectional design was considered the most useful design that led to the achievement of the researcher's purpose and the drawing of meaningful conclusions from pre-service teachers' perspectives on the use of Information and Communication Technology.

Population

The population of the study included pre-service teachers of Berekum College of Education and the target population were male and female pre-service teachers.

Sample and Sampling procedure

In order to have a representative sample of the population, convenient sampling and random sampling were used. In all, thirty (30) questionnaires were responded to by the participants from all the levels of the institution.

Research instrument

The research instrument used was questionnaires. As a data collecting instrument, questionnaires can either be structured or unstructured. The researchers employed semi structured questionnaires which involved both close-ended and few open-ended questions. Self-administered questionnaire was designed and divided into three sections as follows: demographic and social data, the types of technologies pre-service teachers use and the ways of using technologies to support learning.

Data Collection Procedure

The researchers visited the respondents in their various dormitories to administer the questionnaires. The researchers spent three days in collecting the data, most participants spent on the average eight minutes in responding to the questionnaire. Informed consent was sought from the participants to participate in the study and can withdraw at any time. Ethical considerations, principles and the rights of individuals and institutions were strictly taken into consideration and not compromised. Respondents were assured of confidentiality, anonymity and privacy of their responses and that information would not be divulged or used for anything else except for the purpose of the study.

Data analysis

Quantitative data collected from the field was analyzed using IBM-SPSS (version 25). To answer the research questions, descriptive statistics was employed, where the researchers used frequencies, and percentages to make the interpretation of the results more meaningful.

Results

Demographic data of respondents

The socio-demographic data of respondents included age, gender, and classification. The ages of the respondents ranged from 21 to 35. In addition, the ages 26-30 had the highest frequency, followed by ages 21-25. The ages 31-35 had the least frequency. In relation to gender, a total of 15 respondents were males and females also had the same respondents. In terms of classification, sophomore (second years) had the highest frequency, followed by final year.

Table 1

Characteristics	Categories	Frequency(n)	Percent (%)
Age	21-25	10	33.3
	26-30	15	50.0
	31-35	5	16.7
Gender	Male	15	50.0
	Female	15	50.0
Classification	First year	__	__
	Sophomore	25	83.3
	Final year	5	16.7

Source: Field work, 2021

Types of technologies used

All participants affirmed that they get access to technology on campus. In relation to the technologies used by respondents, mobile phone had the highest frequency, followed by laptop, television, and digital voice recorder. Digital camera had the least frequency. None of the participants chose radio as the type of technology they got access to on campus. In addition, respondents did say these technologies have been very helpful. The following responses were given: "It makes school life comfortable and assists me to organize and prepare my assignments"; "it aids me to get access to information around the world". Another participant indicated "it assists me to communicate with friends across the globe". Results obtained is shown below.

Table 2

Technology used	Frequency(n)	Percent (%)
Mobile phone	30	29.7
Radio	__	__
Digital voice recorder	13	12.9
Digital camera	10	9.9
Laptop	29	28.7
Television	19	18.8
Total	101	100

Source: Field work, 2021

Ways of using technologies to support learning

The table below shows the ways pre-service teachers use technologies to support learning. Emailing and presentation had the highest frequency, followed by research and assignment writing. Chatting had the least frequency. In relation to how these technologies have supported students' learning, the following responses were indicated: "It has helped me in the early accomplishing of assignments". Another participant indicated that "Access to knowledge of others doing or studying a similar course". A respondent indicated that "it has been a source of secondary information for research purposes and it is very convenient". Findings of this study on ways of using technologies to support learning are presented in the table below.

Table 3

Technologies to support learning	Frequency(n)	Percent (%)
Research	29	21.3
Emailing	30	22.1
Assignment writing	29	21.3
Presentation	30	22.1
Chatting	18	13.2
Total	136	100

Source: Field work, 2021

Discussion

Information and Communication Technology (ICT) has been very beneficial and play a vital role in the lives of humans. ICT has improved students' learning and performance. In other words, it helps students to develop their skills, boost up their motivation and broaden their knowledge and information. With regards to the types of technologies used and the ways of using technologies to support learning, it clearly shows that pre-service teachers get access to technologies on campus and the most accessible technologies are mobile phone and laptop. From the table above, it is said that these technologies have supported pre-service teachers in their learning in so many ways such as in conducting research, emailing, assignment writing, and presentation among others. This implies they use these technologies to search for new information and get an in depth understanding on a particular topic. This emphasizes what Mahmood (2009) [25] pointed out "students used the computer for the following social media, collaboration, homework, entertainment among others". Mahmood's work also showed that students used computers more for word processing, presentations, data analysis, and emails. Again, according to Mahmood (2009) [25], entry-level students conducted electronic literature searches more frequently than the outgoing classes. Furthermore, according to Yoo & Huang (2011) [35] technology acceptance has been identified as a cultural issue that plays a major role in today's learning experience.

Conclusion and Recommendations

On the basis of the research findings and results, the researchers categorically state that the study has answered the research question one (1) about the types of technologies pre-service teachers get access to and that suggests to be that the findings has confirmed the research questions postulated. The study revealed that with respect to the types of technologies used, all the participants affirmed that they get access to technology on campus. Again, all the participants did say the accessible technologies have been very helpful. In addition, the study indicated that respondents use the accessible technologies for research, emailing, assignment writing, presentation and

chatting. This confirmed that students have access to technologies and have supported them in their learning. Again, findings from the study demonstrated that students use technology in two ways: for academic and non-academic purposes.

The following recommendations were made based on the research findings:

- ICT infrastructures should be provided to the colleges for effective teaching and learning process since it is the basic stage of equipping the youth with the necessary skills and knowledge for national development.
- Teachers should be given the necessary training in ICT usage so that they become familiar with modern pedagogy of imparting knowledge and skills, and possibly become part of curriculum structure for their professional training.
- Policy Formulators should be clear with the ICT policy and its direction of implementation with the necessary guidelines so that the implementation agents like Ghana Education Service, Ministry of Finance among others can help to make a reality since competency in ICT is the modern way of acquiring critical skills and knowledge effective and efficient economic development.
- The colleges of education in Ghana in collaboration with the Ministry of Education and Curriculum, Research and Development Division should fashion out special ICT courses into the curriculum to equip teachers with those special skills and knowledge to enable them use ICT to facilitate teaching and learning.

References

1. Afari-Kumah E, Tanye HA. Tertiary students' view on information and communications technology usage in Ghana. *Journal of Information Technology Impact*,2009:9(2):81-90.
2. Alghamdi IA, Goodwin R, Rampersad G. E-government readiness assessment for government organizations in developing countries. *Computer and Information Science*,2011:4(3):3.
3. Arnseth HC, Hatlevik OE. Challenges in aligning pedagogical practices and pupils' competencies with the Information Society's demands: The case of Norway. In S. Mukerji & P. Triphati (Eds.), *Cases on technological adaptability and transnational learning: Issues and challenges*. Hershey: IGI global, 2012.
4. Association of African Universities. *Technical experts meeting on the use and application of information and communication technologies in higher education institutions in Africa*. University of Dar-es-Salam, Tanzania, 2000.
5. Berge Z. Guiding principles in Web-based instructional design. *Education Media International*,1998:35(2):72-76.
6. Bingimlas KA. Barriers to the successful integration of ICT in teaching and learning environments: a review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education*,2009:5(3):235-245.
7. Bladergroen M, Chigona W, Bytheway A, Cox S, Dumas C, Zyl Iv. Educator discourses on ICT in education: a critical analysis. *International Journal of Education and Development using Information and Communication Technology*,2012:8(2):107-119.
8. Bruniges M. *Developing performance indicators for ICT use in education*. Australia's, 2003.
9. Choudhary R, Choudhary JR. Use of ICTs: to promote good teaching and learning practices in higher management education. *International Journal of Emerging Technology and Advanced Engineering*,2013:3(6):288-294.
10. Daniels JS. Foreword. In Information and Communication Technology in Education: *A curriculum for schools and programme for teacher development*. Paris, France: UNESCO, 2012.
11. Driscoll MP. *Psychology of learning for instruction*. Boston: Allyn and Bacon, 1994.
12. Duffy T, Cunningham D. Constructivism: Implications for the design and delivery of instruction. *Handbook of research for educational telecommunications and technology* New York: Macmillan, 1996, 170-198.
13. Dukić D, Dukić G, Kozina G. Analysis of students' ICT usage in the function of Croation higher education. *Development management*,2012:19(2):273-280. doi:378.147:004.
14. Fosnot C. *Constructivism: Theory, perspectives, and practice*. New York: Teachers College Press, 1996.
15. Galbreath J. Knowledge management technology in education: An overview. *Educ-Techno*,2000:9:28-33.
16. Ghavifekr S, Afshari M, Amla Selleh. Management strategies for E-learning system as the core component of systemic change: A qualitative analysis. *Life Science Journal*,2012:9(3):2190-2196.
17. Grabe M, Grabe C. *Integrating technology for meaningful learning (5th ed.)*. Boston, MA: Houghton Mifflin, 2007.
18. Habib L, Johannesen M, & Øgrim L. Experiences and challenges of International Students in technology-rich learning environments. *Educational Technology & Society*,2014:17(2):196-206.
19. Hirumi A. Student-centered, technology-rich learning environments (SCen TRLE): Operationalizing constructivist approaches to teaching and learning. *Journal of Technology and Teacher Education*,2002:10:497-537.
20. Jonassen D. Objectivism versus constructivism: Do we need a new philosophical paradigm? *Educational Technology: Research and Development*,1991:39(3):5-14.
21. Jonassen D, Reeves T. Learning with technology: Using computers as cognitive tools. In D. Jonassen (Ed.). *Handbook of Research Educational on Educational Communications and Technology* New York: Macmillan, 1996, 693-719.
22. Jung I. ICT-Pedagogy Integration in Teacher Training: Application Cases Worldwide. *Educational Technology & Society*,2005:8(2):94-101.

23. Lebow D. Constructivist values for instructional systems design: Five principles toward a new mindset. *Educational Technology, Research and Development*,1993:41(3):4-16.
24. Lefebvre S, Deaudelin D, Loiselle J. ICT implementation stages of primary school teachers: The practices and conceptions of teaching and learning. In *Australian Association for Research in Education National Conference, Adelaide, Australia*, 2006, 27-30.
25. Mahmood K. Gender, subject and degree differences in university students' access, use and attitudes toward information and communication technology (ICT). *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*,2009:5(3):206-216.
26. Ministry of education (MoE) *ICT in Education Policy*. Ghana. Accra, 2015.
27. Oye ND, Iahad NA, Ab Rahim NZ. The impact of UTAUT model and ICT. theoretical framework on university academic staff: focus on Adamawa State University, Nigeria. *International Journal of Computers & Technology*, 2012, 2(2).
28. Pelgrum WJ, Law N. *"ICT in Education around the World: Trends, Problems and Prospects"*. UNESCO – International Institute for Educational Planning, 2003.
29. Sherman LW. *A Postmodern, Constructivist and Cooperative Pedagogical Strategy for Teaching Educational Psychology Assisted by Computer Mediated Communication*. A paper presentation to the Computer Support for Collaborative Learning '95 International Conference. Bloomington, Indiana, Indiana University, 1995, 17-20.
30. Taber KS. 'Beyond Constructivism: the Progressive Research'. New York Macmillan, 2006.
31. UNESCO. *Information and Communication Technologies in Teacher Education. A Planning Guide*, 2002. http://www.ifip-tc3.net/IMG/pdf/unesconikki129533e.
32. Wang QY, Woo HL. Systematic planning for ICT integration in topic learning. *Educational Technology and Society*,2007:10(1):148-156.
33. Wang T. Rethinking teaching with information and communication technologies (ICTs) in architectural education. *Teaching and Teacher Education*,2009:25:1132-1140. doi:doi:10.1016/j.tate.2009.04.007.
34. Wilson KB, Ayebi-Arthur K, Tenkorang EY. ICT integration in teacher education - a study of University of Education, Winneba. *Journal of Science and Mathematics Education*, 2011, 15(1). http://files.eric.ed.gov/fulltext/ED538533.pdf.
35. Yoo SJ, Huang WHD. Comparison of Web 2.0 technology acceptance level based on cultural differences. *Journal of Educational Technology & Society*,2011:14(4):241-252.