



## Research Article

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## Determining the Pre-Service Teachers and Tutors of Colleges of Education Usage of Technology in Teaching and Learning

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**Abstract:** The study sought to investigate technology usage among pre-service teachers and tutors of selected Colleges of Education in Ashanti Region, Ghana to uncover the level of technology integration in the teaching and learning. Investigating pre-service teachers and tutors level of technology use in teaching and learning was necessary since this knowledge could ensure efficiency in technology integration in teaching and learning among pre-service teachers and tutors in colleges of education. Quantitative research design which involves survey was used to answer the research question; “What is the level of technology integration in the teaching and learning process by Pre-service teachers and Tutors among public Colleges of Education in Ashanti Region, Ghana?” Three hundred and thirty-eight (338) pre-service teachers of College of Education who were in level 200 of the 2019/2020 academic year, offering either Mathematics or Science or Visual art were selected through purposive sampling technique and thirteen (13) tutors were sampled using convenience sampling technique. Data was analysed using descriptive statistics (mean and standard deviation). The study revealed that there was a negative attitude of pre-service teachers and tutors towards computers; pre-service teachers and tutors of colleges of education as revealed in the study show high competencies in their use of computers in teaching and learning; access to the use of technology in teaching and learning is not a challenge to teachers in the study. The study recommended that factors causing negative attitude of pre-service teachers and tutors of Colleges of Education towards technology integration into teaching and learning be identified and attended to by management of Colleges of Education and other stakeholders. Again, conscious effort to cultivate the habit of using computer frequently in teaching and learning should be encouraged at the colleges of education. In addition, high competencies demonstrated by pre-service teachers and tutors should be sustained through workshops and seminars.

**Keywords:** Integrating Technology, Teaching And Learning, Pre-Service Teachers, Tutors.

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## INTRODUCTION

As the world moved into the 21st century, schools have to enculturate students to be lifelong learners. Students need to learn how to seek out new information, think critically and show initiative to meet up with the challenges of the fast-changing world. This can be achieved through technology integration into teaching and learning.

The term “technology” is an important issue in many fields including education. This is because technology has become the knowledge transfer highway in most countries. Technology integration nowadays has gone through innovations and transformed our societies that has totally changed the way people think, work and live (Grabe, 2007). As part of this, schools and other educational institutions which are supposed to prepare students to live in “a knowledge society” need to consider integration of technology in their curriculum (Ghavifekr *et al.*, 2012).

Technology Integration in education refers to the use of computer-based communication, incorporates into daily classroom instructional process. In

conjunction with preparing students for the current digital era, teachers are seen as the key players in promoting it through technology integration in their daily classrooms. This is due to the capability of Technology integration in providing dynamic and proactive teaching-learning environment as revealed by Arnseth & Hatlevik (2012). The authors further state that, the aim of Technology integration in teaching and learning is to improve and increase the quality, accessibility and cost-efficiency of the delivery of instruction to students.

Davidson & Christiansen (2014), reported that technology integration into teaching and learning is a transformative tool, and its full implementation into the school system is necessary to prepare students for the information which they will inherit. Technology integration in education generally means technology-based teaching and learning process that closely relates to the use of learning technologies in schools. Due to the fact that students are familiar with technology and they will learn better within technology-based environment, the issue of technology integration in

schools for teaching and learning process, specifically in the classroom is vital (Ghavifekr & Rosdy, 2015).

With the development of learning technologies, education system has changed rapidly. This is due to the capability of technology to provide a proactive, easy access and comprehensive teaching and learning environment. Reforms in schools have focused on promoting interaction of teachers and learners and enhancing the level of teaching in the contemporary era. The technology integration in the classroom teaching and learning is indispensable in the realization of such reforms. Accessibility to computers has also been facilitated by the introduction of computer labs in many of these Educational Institutions. Provision of computers is considered a significant approach for promoting technology in these high schools (Simon & Ngololo, 2015). Increased teacher competence and confidence in technology integration ensure classrooms are managed effectively (Islam & Grönlund, 2016). Integration of technology in the classroom effectively requires improved skills and access to technological tools for teachers. As a result, schools are encouraged to adopt computer in their teaching. Integration of technology in high schools has facilitated global cooperation about integrating ICT in learning (Yilmaz, 2017).

Information and communication technology is stated in the 2018 basic education curriculum as a pedagogical tool for teaching and learning at the basic education level (NACCA, 2018). Thus, technology integration in teaching and learning is fused in the educational curricula as a highway for teaching and learning process (Ali *et al.*, 2013; & Buabeng-Andoh, 2013). There is therefore, the need to examine the level of technology integration in the teaching and learning process by Pre-service and Tutors of public Colleges of Education (CoE). This is to ascertain their preparedness in the implementation of the ICT aspect of the basic school curriculum. Whatever transpired between these two groups of people regarding integration of technology in teaching and learning is eventually what is going to be seen in the various basic school classrooms.

## LITERATURE REVIEW

### The Will, Skill, Tool (WST) Model of Technology Integration

The Will, Skill, Tool (WST) model of technology integration postulates that enhancing an educator's will, skill, and access to technology tools leads to higher stages of classroom technology integration, which in turn help to achieve students learning outcome (Knezek *et al.*, 2000). Hence its adoption for the study to ascertain technology integration into teaching and learning by Pre-service and Tutors. Knezek *et al.* (2000) defines WILL as the attitude which the teacher has towards ICT usage and integrates it in the teaching and learning process.

According to Knezek *et al.* (2000) attitudes vary but the variants should gear towards promoting the intention and the easiness to use technology in the teaching and learning. Another construct on the left hand- side of the WILL, SKILL TOOL focuses on the Skill. The authors define the skill as the ability to use technology tool in the teaching and learning. Knezek *et al.* (2000) asserted that a skill is the major predictor of ICT integration in teaching and learning. The authors identify four variants of skill in the second construct. The third and last construct is tool. Which the authors describe as the access to technology tools and technology infrastructure. The authors are of the view that the teacher may have the will and the skill but the availability of technology tools will enable the teacher to integrate technology in the teaching and learning to achieve results.

## TECHNOLOGY INTEGRATION INTO TEACHING AND LEARNING IN TERMS OF COMPETENCY, ACCESS AND ATTITUDE

### Technology Competency (Skill)

Competency is defined as the ability to execute a specific task (Meelissen, 2008). Meelison also asserted that teachers' competencies in computer integration are usually measured by using self-assessment. One might opine that teachers' competencies should be conceived as self-belief measures, which are referred to as "confidence in one's competence" (Bandura *et al.*, 1999). A number of studies have proven that technology competencies are positively linked to a person's willingness to choose and participate in computer-related activities, having expectation of success in those activities, and persistently or effectively coping behaviors when faced with technology-related challenges (Looney *et al.*, 2004; & Sang *et al.*, 2010; & Smarkola, 2008). Teachers with high levels of technology competencies make frequent use of computers and experience less computer-related anxiety. However, teachers who have low level of technology competencies are more confused and more anxious, and reluctant to use computers when they come across challenges (Tondeur *et al.*, 2012). The lack of confidence among the teachers in using ICT in teaching suggests the inability to deliver instructions that could elicit hands-on activities, feedback, assessment of performance, and learning which confirms Dooley's view (1999) that when teachers lack the necessary confidence to integrate a technology into their lessons, they tend to ignore it. The lack of use of ICT applications during teachers training make them reluctant to use the available facilities even if they had access, and they lack the confidence to learn the applications on their own. With proper training, teachers could make their lessons more practical and participatory to students. In addition, with properly trained personnel, school districts and school

administrators could use information technologies to efficiently handle the various non-instructional tasks (Antwi *et al.*, 2018). The study further indicated that teachers did not receive adequate training in the use of information technologies in their teacher preparation institutions and therefore, lacked the needed skills and were reluctant to use technology in the classroom to enhance teaching and learning (Antwi *et al.*, 2018).

People have to keep themselves abreast with the changing technologies to help them to interpret available information in order to make sense of and function well in this complex and interconnected world (Organization for Economic Co-operation Development (OECD, 2005). This calls for better alignment of technology integration, pedagogical principles, curriculum and content as well as teacher trainer competencies within teacher training programmes (Agyei & Voogt, 2011; & Tondeur *et al.*, 2012).

Teachers play such a critical role in ensuring that learners achieve their full potential that their training and subsequent development require (NACCA, 2018). The document makes it clear that the pre-service-teacher should have high possible standards in knowledge, conduct and practice in the workplace. The National Teaching Council (NTC) set out the minimum levels of practice that all trained teachers must possess at the end of their teacher preparation courses to be able to play such a critical role. The minimum levels of practice are described as Standards that the pre-service teachers must meet. The teacher should employ a repertoire of learning strategies in order to meet the learning needs of all children through the application of relevant resources (NACCA, 2018).

### **Computer Attitudes (Will)**

The concept 'attitude' can be divided into three components: affective, cognitive, and conative Attitudes towards computers influence teachers' acceptance of the usage of technology, and also affect whether teachers integrate technology into their classroom activities (Meelissen, 2008). Huang & Liaw (2005) in their study also stated that among the factors that affect the successful integration of computers in the classroom, teachers' attitudes towards computers is a key factor. The study pointed out that no matter how sophisticated and powerful the state of technology is, the extent to which it is implemented depends on the user's positive attitude towards it (Huang & Liaw, 2005). Many research findings have confirmed that there are several factors that affect computer attitudes such as gender, socio-economic status and age. Recent studies about the effect of age on attitude towards computers have shown that younger people tend to have more positive attitudes towards the use of computers than their older peers (Christensen & Knezek, 2016; & Meelissen, 2008). This gives an indication that younger teachers are more likely to use technology in instruction than older ones. Other related studies that have been conducted into

attitudinal and motivation/personality factors towards technology in education contained attitude surveys consisting of questions about fear of computers, extent of liking technology, attitudes towards using technology in school, enjoyment in using computers, productivity/utility of computer, computer use for e-mails have shown strong links between pupils' and teachers' attitudes and the effect on technology use and learning (Marshall & Cox, 2008). For example a number of studies have found "Computer anxiety" to be a consistent measurable construct present in teacher data sets on teachers' attitudes towards computers (Knezek & Christensen, 2009).

According to Pamuk & Peker (2009) computer anxiety is the most important dimension of attitude towards computer scale; indicating that teachers who are anxious about computers tend to develop negative attitudes towards computers and express opposition to their use. Other studies have demonstrated that the cognitive component of attitude is an important one.

The effect of the conative component of computer attitudes on computer use is also well addressed by some studies. Marshall & Cox (2008) revealed teachers with Internet access at home demonstrate more positive attitudes towards computers, and feel a greater need for computers in their lives. (Knezek & Christensen, 2016) came out with similar result to confirm that teachers without access to the Internet at home reluctantly integrate technology into their teaching.

### **Access to Technology Tools (Tools)**

In many advanced countries, computer has become so common to the extent that access to the computer is no more a subject of discussion (Meelissen, 2008; & Morales, 2006). Hence, the concern now is the people's attitude to computer and their competencies as well. Inan & Lowther (2010) have emphasized that access to technology tools is not empirically enough to improve quality of instruction to support student learning.

This suggests that the accessibility to technology tools is no more a major predictor to determine teachers' integration of technology in the teaching process in advanced countries. This assertion cannot be said of developing countries which Ghana is no exception. Gurcan-Namlu & Ceyhan (2002) talks about the following sub topics such as computer access level, usage frequency, computer ownership, and the experience in the usage as indicators of someone's level of use of computers.

According to the study, only a small number of the African population has access to computers (Murphy *et al.*, 2002) and 4% has access to the Internet (Resta & Laferrière, 2008). Aguti & Fraser (2006) in a study to integrate technology in Distance Education

Program at the Makerere University of Uganda reiterated that the unavailability of computers to access technology is a key barrier to technology integration in most developing countries. Thus unavailability of technology tools could be a key factor in determining a teacher's integration of technology in most African countries. Tekinarslan (2008) investigated computer anxiety and accessibility of personal computers between two groups of Dutch and Turkish students. The results of the study showed that the Dutch students demonstrated a minimum level of computer anxiety levels and therefore has a higher level of technology use than the Turkish students. This was demonstrated by the relatively high levels of computer access and computer usage frequencies of the Dutch participants. These results are parallel with findings of other studies by Christensen & Knezek (2001); & Gurcan *et al.* (2002).

Ghana's education policy makers over the years have attempted to encourage the use of Information and Communication Technology (ICT) in the classroom through educational reforms and other policies but these attempts seem to have lost their substance partly because "the commitment of government to the provision of infrastructure for ICT policy implementation has been minimal" (Amenyedzi *et al.*, 2011). These stated infrastructural challenges question teachers' knowledge and ability to integrate technology into teaching and learning of subjects like geography and mathematics which requires visual/media aids for learners' understanding. For instance, a study by Antwi *et al.* (2018) blamed the lack of IT usage in SHS by teachers on the inadequate use of information technologies to insufficient equipment, insufficient skills on the part of teachers, and inaccessibility to the available equipment.

Mumtaz (2002) in his view asserted that access to resources, quality of software and hardware, ease of use, incentives to change, support and commitment to professional learning are among other factors influencing teachers' decisions to use new technologies in classrooms.

Thus, in general, accessibility of technology as mentioned in the will – skill - tool model tends to affect attitudes and competencies and has a positive relationship with the level of technology use.

Teachers attributed the inadequate use of information technologies to insufficient equipment and inaccessibility to the available equipment (Antwi *et al.*, 2018).

According to the study by Antwi *et al.* (2018), the limited number of computers in the participants' schools did not promote the use of software such as ArcView and PowerPoint, which are very efficient in teaching geographic concepts. Data suggests that because the internet accessibility was limited to only

computer laboratories, geography teachers did not often use search engines such as Google Earth, Infoseek, and/or Infomaps, in promoting geographical concepts.

## METHODOLOGY

### Study Design and Participants

Qualitative research design which involves survey was used to answer the research question; "What is the level of technology integration in the teaching and learning process by Pre-service teachers and Tutors among public Colleges of Education in Ashanti Region, Ghana?"

Three hundred and thirty-eight (338) pre-service teachers of College of Education who were in level 200 of the 2019/2020 academic year, offering either Mathematics or Science or Visual art were selected through purposive sampling technique. Thirteen (13) tutors were sampled using convenience sampling technique. Three selected public Colleges of Education (College A, B and C) in Ashanti Region, Ghana, were engaged for the study.

### Measures

Data were collected using questionnaire. A questionnaire designed by Knezek & Christensen (1998; 2001), was adopted for the study. The questionnaire sought to provide answers to the research questions stated above. The questionnaire was segmented into three components. The three components are:

- Teachers' Attitude towards Computer (TAC). The questionnaire the authors designed is a 1 – 17 item Likert differential instrument for measuring teachers' attitude competency. Eight items of the TAC were adopted and used to explore the attitude of the in-service and tutors of Colleges of Education in this research.
- Access to Technology Tools towards the usage of computers/ Tool on technology integration. These measurement instruments have been tried by many researchers and proven to be reliable.
- The Technology in Education Competency Survey (TECS) was another construct that was used. According the authors, technology in education competence is a self – report measure of technology competence. The Likert – scale used to collect data for the quantitative analysis had an original P value of 0.713 which shows high reliability and internal consistency. After piloting it with 50 participants of college students and tutors outside the sampled area gave a P value of 0.723

The questionnaire is on a five-point Likert scale ranging from strongly disagree =1, Disagree =2, Not sure =3, Agree =4, strongly Agree =5. Below shows the sample of the adopted questionnaire used in the study.



**Will**

Please rate your degree of agreement by choosing one of the 5 options that best reflects your agreement with each statement.

<b>Statement</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Working with a computer makes me nervous					
Using a computer is very frustrating					
Computers are difficult to use					
I think that it takes a long time to finish a task when I use a computer					
I get a sinking feeling when I think of trying to use a computer					

Strongly disagree =1, Disagree =2, Not sure =3, Agree =4, strongly Agree =5

**Skill**

Choose the categories that represent your opinion about each of the statements.

<b>Statement</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Computers could enhance remedial instruction					
Computers can help accommodate different teaching styles					
Computer can be used successfully with courses which demand creative activities					
Computers help to incorporate new teaching methods					
Teacher training should include instructional applications of computers					
Computers will relieve teachers of routine duties					
Computers can help incorporate new ways of organizing student Learning					
Computers can help teachers provide more individualized feedback to students					

Strongly disagree =1, Disagree =2, Not sure =3, Agree =4, strongly Agree =5

**Tool**

In the following statements indicate your understanding of ICT. Using a scale of strongly

disagree =1, disagree =2, Not sure =3, Agree =4, Strongly Agree =5

<b>Statement</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
If there is a computer in my future classroom, It would help me to be a better teacher					

I would like to have a computer for use in my classroom  
 If there was a computer in my classroom it would help me to be a better teacher  
 I believe that the more often teachers use computers, the more I will enjoy school

**Procedure**

The participants were educated on the need to respond to the instrument. Effort was made to establish good rapport with respondents which yielded accurate responses willingly by Pre-service teachers and tutors of College of Education. Individual respondents were allowed to independently respond to the instrument.

**Data Analyses**

There are two groups of responses for the study. One group that represents the Pre-service answered the questionnaire as well as the Tutors group.

Data was analysed using descriptive statistics (mean and standard deviation) with the help of IBM SPSS statistics 22 for research question.

**RESULTS**

**Demographic Characteristics**

Although this section did not form part of the research objective, they were used to describe the background of the college and respondents. The results are shown in Table below:

**Table 1.** Demographic Characteristics for Colleges

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	College A	149	44.1	44.9	44.9
	College B	67	19.8	20.2	65.1
	College C	116	34.3	34.9	100.0
	Total	332	98.2	100.0	
Missing	System	6	1.8		
Total		338	100.0		

Source: Field Study (2020)

**Table 2.** Demographic Characteristics for Tutors

	In-service	N	%
<b>Age</b>	36-40	2	5.7
	41-45	14	40.0
	46-50	18	51.4
	51 and above	1	2.9
<b>Gender</b>	Male	28	80.0
	Female	7	20.0
<b>College</b>	A	13	37.1
	B	13	37.1
	C	9	25.7
<b>Qualification</b>	M.A	3	8.6
	MSC	14	40.0
	MPHIL	18	51.4
<b>Subject Area</b>	Art	5	14.3
	Maths	15	42.9
	Science	15	42.9
<b>Working period</b>	1-5 years	2	5.7
	6-10 years	21	60.0
	11-15 years	11	31.4
	16-20 years	1	2.9

Source: Field Study (2020)

The study assesses the level of teachers' attitudes (will), competencies (skill) and access (tool) to technology tools. Below gives an assessment of Pre-service and Tutors level of attitudes (will),

competencies (skill) and access (tool) to technology tools.

**Teacher's Attitude towards Computers (TATC)**

**Table 3.** Attitude towards Computer (TAC)

Subscale	Pre-Service (n=338)		Tutors (n=35)	
	Mean	SD	Mean	SD
Working with computers makes me nervous	2.04	1.18	1.83	0.57
Using a computer is very frustrating	1.85	1.02	1.80	0.58
Computers are difficult to use	1.99	1.09	1.94	0.64
I think that it takes a long time to finish a task when I use a computer	1.66	1.05	1.54	0.61
I get a sinking feeling when I think of trying to use a computer	1.92	1.05	1.74	0.66
<b>Total</b>	<b>1.89</b>		<b>1.77</b>	

Source: Field Study (2020)

The table 4.2.1 indicates a comparison of the two groups (Pre-service and Tutors) of participants in terms of their level of computer attitudes. The overall attitudes of teachers towards computer (Mpre-service = 1.89, Min-service = 1.77) suggest a negative attitude of

teachers towards computers as their mean values are below half of the overall mean of 5.

**Technology in Education Competency Survey (TECS)**

**Table 4.** The Technology in Education Competency Survey (TECS)

Subscale	Pre-Service (n=338)		Tutors (n=35)	
	Mean	SD	Mean	SD
Computers could enhance remedial instruction	3.98	1.09	4.09	0.37
Computers can help accommodate different teaching styles	4.22	0.96	4.14	0.36
Computers can be used successfully with courses which demand creative activities	4.02	1.12	4.23	0.70
Computers help to incorporate new teaching method	4.19	0.95	4.40	0.70
Teacher training should include instructional applications of computers	4.24	0.88	4.43	0.61
Computers will relieve teachers of routine duties	3.63	1.22	4.43	0.56
Computers can help incorporate new ways of organising student learning	4.34	0.82	4.40	0.50
Computers can help teachers provide more individualised feedback to students	4.21	0.97	4.37	0.49
<b>Total</b>	<b>4.10</b>		<b>4.31</b>	

Source: Field Study (2020)

According to table 4.2.2 The Technology in Education Competency Survey (TECS) variable of will-skill-tool model used in measuring the teachers' technology revealed high level of competencies of the two groups. The Pre-service and Tutors scored mean of 4.10 and 4.31 respectively out of the overall mean of 5. According to Sang *et al.* (2010), teachers with higher levels of technology competencies used computers more often and experienced less computer-related anxiety than teachers with lower levels of technology competencies as the latter become more frustrated and

more anxious, and hesitate to use computers when they encounter obstacles. This also confirmed numerous studies that computer competencies are positively correlated with an individual's willingness to choose and participate in computer related activities, expectation of success in such activities, persistence or effective coping behaviours when faced with computer-related difficulties (Looney *et al.*, 2004; Sang *et al.*, 2010; & Smarkola, 2008).

**Tool on Technology Integration**

**Table 5.** ICT tools application

Subscale	Pre-Service (n=338)		Tutors (n=35)	
	Mean	SD	Mean	SD
If there is a computer in my future classroom, it would help me to be a better teacher	4.29	1.09	4.17	0.38
I would like to have a computer for use in my classroom	4.48	0.82	4.17	0.45
If there was a computer in my classroom it would help me to be a better teacher	4.18	1.08	4.43	0.50
I believe that the more often teachers use computers, the more I will enjoy school	4.02	1.14	4.49	0.51
<b>Total</b>	4.24		4.32	

Source: Field Study, (2020)

Four variables indicating levels of access to technology tools which is a variable of will-skill-tool model were used in the study for measuring teachers' access to technology tool as shown in table 4.2.3 above. High levels of technology access by teachers (M pre-service = 4.24, M tutors = 4.32) was realised from the study. This indicates that access to technology tools by Pre-service and Tutors of colleges of education is not a challenge. This will enhance technology integration in teaching and learning as lack of ready access to technologies by teachers is a key barrier to technology integration (Agti & Fraser, 2006).

## DISCUSSION OF RESULTS

The findings from the survey revealed the two groups (Pre-service teachers and Tutors) level of computer attitudes. The overall attitudes of teachers towards computer integration into teaching and learning (M pre-service teachers= 1.89, M tutors= 1.77) suggest a negative attitude of teachers towards computers as their mean values are below half of the overall mean of 5. This confirmed a study by Christensen & Knezek, (2016) that older people like teachers and tutors tend to have negative attitude towards the use of computers than younger people. On the Technology in Education Competency Survey (TECS) variable of will-skill-tool model used in measuring the teachers' technology competence revealed high level of competencies of the two groups. The Pre-service teachers and Tutors scored mean of 4.10 and 4.31 respectively out of the overall mean of 5. Hence, the Pre-service teachers and Tutors, as revealed in the study shows high competencies in their use of computers. Also, on the access to technology tools, four variables indicating levels of access to technology tools were used. The findings indicated high technology access by teachers (M pre-service teachers= 4.24, M tutors= 4.32). This indicate that access to technology tools by pre-service and in-service teachers of colleges of education is not a challenge.

## CONCLUSIONS

- A negative attitude of pre-service and in-service teachers towards computers as was shown in the study.
- Pre-service and tutors of colleges of education, as revealed in the study, show high competencies in their use of computers in teaching and learning.
- Access to technology integration in teaching and learning is not a challenge to teachers in the study as evident in the descriptive statistics analysis.

## Recommendations

The study recommended that factors influencing negative attitude of pre-service teachers and tutors of Colleges of Education towards technology integration into teaching and learning be identified and attended to by management of Colleges of Education and other stakeholders of college of education schooling. That is assisting pre-service teachers and tutors of Colleges of Education in managing the nervousness, frustration and sinking feeling associated with the use of computers. In addition, high competencies demonstrated by pre-service teachers and tutors should be sustained through workshops and seminars. The fully furnished computer laboratories at the Colleges of Education should be maintained to continually ensure pre-service teachers and tutors get high access to technology resources.

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