UNIVERSITY OF CAPE COAST

# ASSESSING THE EFFECT OF COMPUTER TECHNOLOGIES ON SCIENCE STUDENTS' ACADEMIC PERFORMANCE IN SECOND CYCLE SCHOOLS.

## (A CASE STUDY: SELECTED SECONDARY SCHOOLS IN SEKONDI-TAKORADI METROPOLIS)

APPIAH-BOATENG CHARLES

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BY

APPIAH-BOATENG CHARLES

Dissertation submitted to the department of Maths and Science Education of the College of Distance Education, University of Cape Coast, in partial fulfillment of the requirement for award of Master of Education in Information Technology

JANUARY 2021

## DECLARATION

Candidate Declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: …… Date: ……

Name: ……..

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by the University of Cape Coast.

Supervisor's Signature: …….. Date: ……

## ABTRACT

The primary objective of the study was to access the effect of computer technologies on science students' academic performance in secondary schools in the Sekondi Takoradi Metropolis (STMA). The study Assesses how the use of computer technologies affects science students' academic performance. Many Senior High School Students in Ghana struggle a great deal in the Sciences related courses, this is because of the complex concepts, laws, theories and models. Teachers in the various schools seem not to effectively use computer technologies in their lesson delivery and this affects the quality of the students output in the Secondary Schools. Descriptive survey was employed, which used both quantitative and qualitative data. The target population included teachers and students in selected schools in the Sekondi College Metropolis. Data was gathered through the use of questionnaire. A sample size of about 345 participants was selected for the research. The results of the study revealed that computer technologies had the capacity to influence learning of science positively in Senior High Schools. The theoretical frame work adopted for this dissertation is based upon Unified Theory of Acceptance and Use of Technology. (UTAUT). The results were analyzed and presented in the form of tables and bar charts.

## ACKNOWLEDGEMENTS

With a heart filled with gratitude, I am most thankful to the Almighty God for His strength and knowledge throughout my study.

Secondly, I would like to thank my Supervisor, Dr. Valentina Arkoful for her interest in the subject matter and unflinching assistance. I am again grateful to the Heads of the various Secondary Schools for their enormous support in my data collection especially Sekondi College and Fijai Senior high Schools.

I would like to thank my wife and daughter Mrs. Leona Appiah-Boateng and Everleon Yvette Appiah Boateng for their love and support in my academic endeavor. I also like to thank my sisters for their constant support and encouragement throughout this study. I would also like to especially thank Madam Felicia Grace Baiden for proof-reading and editing my work. I also like to thank Mr. kingsley Yankey for his Valuable suggestions and comments.

Thirdly, I would also like to appreciate and express my deep and sincere appreciation to my pastor Johnson Bandoh for his tremendous encouragement throughout my program

Finally, I wish to sincerely thank the teachers and students who assisted me by responding to the questionnaire I administered.

## DEDICATION

To my beloved mother Mrs. Sophia Arthur for her love and support

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# CHAPTER ONE

## INTRODUCTION

Societies all over the world have ways and means of transmitting their culture, values and skills onto their characteristics as helping to make individuals in a given society all round personalities to enable them contribute meaningfully

aim, societies have from time immemorial tasked certain institutions and individuals to prepare young people in the society to become useful citizens in future, for this reason, specially trained individuals (teachers) as well as institutions have been established for the education of people in this society.

Every aspect of our life today has been influenced by the use of information and communication technology(ICT) as a result of this, the use of information and communication technology has been embraced widely by the society today.According to Wagner (2007), the ways in which we learn, work and spend our leisure time has greatly been shaped by information and communication technology (ICT), As such; our success as individuals or a nation depends on our ability to understand the use of computers. The importance of computertechnology in one's everyday life cannot be overlooked because it is clearly shaping the ways in which we learn, work, and spend our leisure time, computer technology has revolutionized the way we do things today in Ghana and as a result both Government and schools have invested huge sums of Ghana cedis for the integration of technologies into the curriculum in second cycle schools.

The development of ICT in education will result in the creation of new possibilities for learners and teachers to engage in new ways of information

acquisition and analysis. ICT however will enhance access to education and improve the quality of education delivery on daily basis. Hence the government commitment to develop and improve ICT within the education sector to transform the education system and hence improve the lives of citizens.

The chapter has been organized under the following headings: background to the study, statement of the problem, research questions, objectives of the study, significance of the study, limitations and delimitations of the study. Theoretical and conceptual frameworks.

**Background of the Study**

Computers play a major role in the development and application of knowledge; they can also facilitate the teaching and learning of all subjects. The National Science Teachers Association (NSTA) (2007) therefore asserts that computers should have a major role in the teaching and learning of all subjects thought in school,many Students are now participating in research and learning by using computer technologies for the acquisition, analysis, presentation and communication of data.

Computers help in the management of instructional techniques and make record keeping easier in the classroom. It helps to learn the concepts and processes through simulations, graphics, sound, data manipulation and model building. The laptop computer helps students to gather and analyse data, study and share information. The essence of using computers in education is to add to the teachers' skills and techniques.

Computer technologies can be used in extending the classroom to the larger world, so that learners can gain knowledge and ideas beyond and within the

classroom. The use of computers in teaching and learning will contribute to self-motivated learners and the use of multiple teaching methods. (Bamblett and Owens 2003). Edward (2000) stated that the use of computers in teaching and learning can save time and contribute to successful delivery of lessons that extends learning experiences. Teachers and students have failed to utilize the benefits associated with computer technologies, which has provided a gap between teaching and technology.

In order to adopt computers successfully in education, it may depend on some variables such as teachers' knowledge, skills and attitude towards the use of computers, availability of computers and school management attitude. The successful implementation of computers in education will depend on the quality of teaching (Akbaba-Altun (2006) & Reid (2002According to Tchombe et al 2008, the acquisition of knowledge of computers is not just important but teachers also need to know how to use computers pedagogically. They opined that the use of computers appropriately, can quicken the development of higher cognitive skills, deepen learning and contribute to the acquisition of skills needed for learning all lifelong and fit into current job market. The most unfortunate thing is that adopting technology in education does not necessarily promote teachers teaching strategies to include learner-centered pedagogies that are beneficial, for the 21st century learners. (Bohlin, 2001).

Performances in Senior Secondary Certificate Examination (S.S.S.C.E) and now West Africa Certificate Examination (WASSCE) throughout the country have not been encouraging. (The Free Press of 1994, May 20thp1) reported that in 1993 when the first batch of (S.S.S.C.E) candidates sat for the

exams, only 1,130 students qualified out of a total of 42,121 who wrote the University Entrance Examination. This problem must be noted that, it cut across the whole country. In 1995 also, 67,597 candidates from 507 schools sat for the S.S.S.C.E. Out of this 51,805 passed at least one subject. The rest failed in the various subjects. (Ghanaian Times 1996, June 21 p1).

Whilst this situation of low academic performance has become a source of worry to all stake holders in this country, Senior High Schools in the Sekondi Takoradi Metropolis, the focus of this study is not an exception. Statistics available indicate a deteriorating academic performance as far as Senior High Schools in the Sekondi Takoradi Metropolis, is concerned. For example, in 2013, out of over 2400 candidates presented for W.A.S.S.C.E only 450 students passed in all the subjects. The rest failed miserably especially in science related subjects. The 2014 was bad so as 2015. This is the reason why the researcher wants to undertake this research to identify what actually caused the poor performance in Senior High Schools in the Sekondi Takoradi Metropolis among science students.

**Statement of the Problem**

Despite the availability of computers in schools in Ghana, its adoption and integration has become an issue for both teachers and students in teaching and learning. Most of the secondary schools have computers kept in the ICT laboratory, only the lab attendants have access to these computers at all times.

Brew (2011), states that the study of Science and Mathematics is a major problem for many students globally and it is not an exception for students in the second cycle schools in Ghana. Students Records Management and Information System (SRMIS) (2012), confirms this, that, as a result a good

number of students in sciences do not perform as well as students in the Humanities.

Many students find Science to be a difficult and demanding discipline as compared to other areas because it deals mainly with complex concepts, theories, complicated laws and models. The inability or weakness of the students to understand the concepts has been the focus of studies conducted so far. Indeed, the assertion that students do not perform well in Science and Mathematics may be linked to the fact that Science teachers and students are not engaging in the frequent use of computer technologies to support and supplement their learning experiences, as the technologies help in simplifying concepts and could lead to improved academic performance.

In Africa, most especially Ghana, there is a dearth in research on the need to use computer technology in learning, it is interesting to note that In Ghana educational policies that were drawn have done little in bridging the gap that has been created between teachers, students and the use of computer technologies. Most schools are faced with challenges such as lack of qualified teachers, inadequate infrastructure and poor implementation of government policies etc.

It is against this background that the researcher seeks to conduct the study on how computer technologies can influence students' academic performance in Science in second cycle schools.

**The purpose of the study**

The purpose of the study was to examine the extent to which the use of computer technologies improves the academic performance of senior high schools in the Sekondi - Takoradi Metropolis.

**Significance of the Study**

The findings of this research will benefit various stakeholders (Government, teachers, HODs, students etc). It will be useful for Science students in assessing the opportunities computers have on their academic lives.his research will benefit educators by extending the knowledge base that exists already.This study assesses competencies of teachers regarding computer technology, access to computer training and development, their views on barriers to and issues around attaining these competencies.

The study may be of significance to teachers in other subject areas, since many of them may also experience the same difficulties, as those encountered by Science teachers.

The findings from this research can be generalized to other schools outside the Sekondi - Takoradi Metropolis.

**Specific Objectives**

The objectives of this study are as follows:

1. To assess teachers' level of competence in the use of computers.
2. To examine the attitudes of teachers in the use of computers.
3. To examine the difference in perception that teachers in the Senior High Schools have with respect to the use of computer technologies.
4. To identify the barriers of adoption and integrating computer technology into Science teaching in Senior High Schools in the Sekondi - Takoradi Metropolis.
5. Assess how the use of computer technologies affects students' academic performance.

**Research Questions**

Specifically, the study answers the following questions:

1. What are the barriers preventing the integration of ICT in education in the Senior High Schools in the Sekondi - Takoradi Metropolis?
2. What requisite skills, training and qualification do science teachers and students have in the use of computers in teaching and learning of science lessons?
3. What are the attitudes of teachers and students toward the use of computers in teaching?
4. What differences in perception do teachers in the Senior High Schools, especially Sekondi - Takoradi Metropolis, have in relation to the use of computers in the classroom?
5. To what extend does the use of computers affect students' academic performanc

**Delimitation**

It would have been good for the study to involve all the 520 senior high schools in Ghana butthe research wasdelimited to Science students and teachers in (5) selected public senior high schools in Sekondi - Takoradi Metropolis (Sekondi College, Ghana Secondary Technical School, Fijai Secondary, Archbishop Potter Girls', Tadisco).

The study could cover all other areas of computer technology usage in schools but delimited to students and teachers usage and the extent to which it was used in teaching and learning.

# CHAPTER TWO

# LITERATURE REVIEW

## Introduction

This chapter reviews what some scholars have written and discussed about the main concept in other parts of the world on the topic under study. The chapter also analyzes some relevant literature and aims at identifying the perceived challenges to computer technologies adoption and integration in education. The challenges to the use of computer technology will be categorized into two, under the headings, 'teacher related challenges which includes fear, lack of training, inadequate knowledge or competence to the use of computers, difficulty in changing teaching methods, limited accessibility, lack of support and time'. The second challenge will be related to schools.

The study of the challenges to the use of computer technologies would help educators in overcoming obstacles and support students to operate in an information age and become successful technology users in the future. (Akbaba-Altun 2006) stated in his conclusion that successful adoption and integration of computer technologies in education is not simple, because it depends on some interlinking variables. Computer technologies are transforming the curriculum in a variety of ways, which demands that teachers adopt new methods of teaching and not the conventional methodologies. Balanskat et al (2006) argue that educators appear to acknowledge and understand the value of integrating computer technologies in education, but there are challenges that are often uncounted.

Mueller et al (2008), concluded that although many teachers are comfortable with technology in general but they may still not be ready or capable to integrate such technology, in their classrooms.

The following topics have been discussed in the review

1. Traditional ways of teaching and learning Science.

2. Meaning of computer technology integration in education.

3.lack of professional development in computer technology integration.

4. Computer technologies available for Science students and teachers.

5. Positive impacts of computer technologies on students' learning.

6. The use of computer technologies on students academic performance.

7.Teachers and students satisfaction with the use of computer technology in teaching and learning of science.

8. Barriers in the Use of computer technologies in Science Learning

9. Improving technology through education

**Traditional ways of teaching and learning Science**

The major concern in education traditionally, had been on how the student was able to master specific content. Teachers were thought of as the most important sources of knowledge and therefore had the responsibility of transferring knowledge to the students (Brown, 2005). Therefore, in the traditional classroom setting, teachers usually did all the talking whiles students only listened (Flanders, 1973; Devinder&Zaitun, 2006). Students therefore only had to chew and pour the content the teacher had passed on previously. The transfer of knowledge on complex concepts is generally the traditional methods of education in the classroom. Teachersused lectures in

teaching and learning of science. Science teachers presented student with only text.

Motiwalla (2007) emphasizes that learning on computers can never replace the traditional classroom, but rather could be used as a complementary learning tool. Wondeson and colleagues (2011), in a survey of 90 engineering students, noticed that most of the respondents were willingly to use thus technology as a complement of the traditional classroom learning. Whiles the main aim of traditional classrooms is to transfer knowledge from teacher to student (Dela Pena-Bandalaria, 2007). Students are not given the opportunity to ask questions, interact socially with other students, discover and solve issues on their own, in most traditional science environment. Students are rather presented with only a predetermined view of various issues and a set of facts, which means that there is no collaboration between students and so they are force to learn on their own (Devinder&Zaittun, 3006). Since traditional classroom environment often do not allow discussion with peer classmates, it brings much difficulty in understanding and application of concept.

**Meaning of computer technology integration in education**

To understand what is meant by Computer integration in education,it is necessary to know the origin of computers and what they really are. According to research, the use of computers became popular in the 1980s when personal computers became available to consumers. Research has also shown that government policies wide world have been influenced by this global competition which has ensured that they keep pace with technological advancements. These policies influenced the mass production of computers for schools and this made many researchers to suggest that computers will be an

important part of the education process for the next generation. The use of information and communication technology (ICT) in implementing a standards-based school curriculum is being articulated in the wider context of educational reform as the acquisition of 21st century skills, i.e. Information and communication technology skills and lifelong learning abilities (Law, Lee & Chow, 2002) Recently information and communication technology integration has been recognized as using computers to learn, rather than learning to use computers (UNESCO/COL, 2004). Technology integration is a complex phenomenon that involves understanding teachers' motivations, perceptions, and beliefs about learning and technology (Woodbridge, 2004). The individual teacher is usually the one who makes the decisions on the classroom practices, also concerning technology. It is obvious that teachers use such tools and practices that support their beliefs about "good learning" and tools that fit easily into the existing conceptual and social organization of classrooms. As Marx, Bluemenfeld, Krajcik and Soloway (1998) noticed, the use of technology tools mainly maintains the existing culture, and they have little potential for transforming teachers' work, or the nature of teaching and learning in classrooms. In the studies of Hakkarainen et al. (2001) and Moseley et al. (1999), it was found that there was a relationship between teachers' pedagogical conceptions and the type of instructional use of computer technology. Teachers who intensively used information technology emphasized the importance of using ICT for facilitating students' participation in progressive inquiry, collaborative learning, and the learners' active engagement in the knowledge formation process, but as Lin (2001) say, the

relationship between teachers' conceptions and practice, is complex, not clear or simple.

According to Kozma (2008) there are three rationales for the introduction of computer technology into education. The first one is the economic rationale, which refers to the role it can play in preparing students as future workers and in supporting economic development. The second is the social rationale where computer technology investment aims to: increase knowledge sharing, encourage cultural creativity, increase civic participation, make government services more accessible and finally enhance social cohesion. The third and final rationale is the educational and pedagogic rationale where computer technology can advance educational reform and improve educational management structures. Similarly, Hepp et al (2004) broadly concur, identifying three reasons for the use of computer technology in education: the development of new skills for the information age, increased productivity and the development of quality learning.

Although computer technology has a great potential to reform or even transform education, a study by Lim and Khine (2006) reported that educators believed that the mere use of computers in their lessons excited and motivated their students to learn. Moreover, the adoption of Computers by education has been seen as a powerful way to contribute to educational change, better prepare students for the information age, improve learning outcomes and competencies of learners, and equip students with survival skills for the information society.

Computer technologies has not only changed the role of teachers in classrooms out has also provided them with a large number of software

packages and websites that can be utilized for educational purposes. Rapid technological development is affording teachers new opportunities to test many more software packages and websites in their lessons (Demirci, 2009). PowerPoint, MS Word and Excel are among the most commonly used software packages in schools today and have pedagogical benefits. Educational change is a slow process, and some educators require more time to gain experience with computers (Naicker, 2011). Educators are sensitive to change and if they do not see a change without any clearly recognised benefits, such as increased efficiency in administrative tasks and improvement in the learners' understanding of the subject, they will be hesitant to use computers in their teaching (Ward & Parr, 2010). Using technology obliges educators to adopt different teaching styles (Zhao &Cziko, 2001). Rather than viewing technology as merely a tool for delivery, it should be seen as a means to improve learning (Keengwe et al., 2008). Providing technology resources without effectively integrating them into instruction will not produce better learners (Tolmie, 2001). Educational institutions can use specialized websites to make learning resources available online at any time. Some educational institutions do not even require students to be physically present. Virtual classrooms have flourished in tandem with improved internet accessibility. The significant barriers of time and distance are rendered almost obsolete in such virtual classrooms (Stennes 2008).

**Lack of Professional Development in Computer Technology Integration**

One of the barriers that stops teachers learn how to use computer technology is insufficient teacher training (Bauer & Kenton, 2005; Yang, 2008). In a study that was done by Yang (2008), it was exhibited that because

of the lack of information technology experts, 46.3% of the 378 teachers stated that they did not have any professional development in computer technology integration. The type of training that teachers receive is also very important. In order to have a change in teachers' teaching methods, professional development must be content-focused and collaborative and this will certainly lead to students' learning (Li & Protacio, 2010; Shi & Bichelmeyer, 2007; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009). Teachers will be able to gain new knowledge from the professional development and integrate it with their teaching methods if enough attention is paid to particular content areas or specific teaching approaches. Teacher professional development should not only pay attention to the particular programs and subject areas and teaching methods but also to the computer technology applications (Dudeney & Hockly, 2007; Parks et al., 2003; Zhao, 2003). The efficacy of computer technology integration is actually related to the teaching methods, rather than computer itself. Teacher professional development should not only focus on how to utilize specific instructional tools, but also on the importance of teaching methods, content and context (Dudeney & Hockly, 2007; Parks et al., 2003; Zhao, 2003). Professional development programs have been used by many educational institutions. They provide teachers with the necessary skills to include computer into their teaching and learning and also provide numerous initiatives to urge teachers to use computer technology (Sheumaker, Slate, & Onwuegbuzie, 2001). Although teachers' knowledge about computer is very important in the integration of ICT, but this is not enough for the actual use of computer technology. Teachers can use computer technology in their

teaching and learning through training programs (Sandholtz & Reilly, 2004). According to Smerdon et al. (2000; Bordbar, 2010), teachers who spent more time in training activities were more prepared to teach with computer technology. Teachers can use computer technology and change their teaching methods through professional training programs (Buabeng-Andoh, 2012). If training programs have high quality, the period for training will be long and new computer technologies are provided for teachers to teach and learn. These can cause teachers to integrate computer into their instruction (Buabeng-Andoh, 2012). Rezaiee (2009) investigated the barriers of development of e-learning in Iran. The results showed that the lack of appropriate training facilities were the main obstacles in using technology. Afshari, Abu Bakr, Wong, and Afshari (2010) conducted a study to determine the extent to which the Iranian secondary school principals use computers. One of the findings of this study was that school should be provided with enough budgets and these budgets should involve funds for training teachers and for hardware and software upgrades.

**Computer technologies available for Science students and teachers.**

Electronic books are digitized forms of books that can be read on Computers and other technologies. They have been found out to be a very important educational tools since they present a less expensive access to textual materials, avail more updated information and provide a more interactive experience with content (Savill-Smith & Kent, 2003).In a study by 112 students found out that reading on computer was more productive than reading on paper when preparing for examinations McConatha and colleagues (2008).

In a study conducted by (Lam *et al*, 2011), teachers were given strategies on how they could convert educational materials into Electronic books, multimedia resources or interactive exercises with the aim of being utilized by students on a variety of mobile phones. It was found that teachers were eager to find new methods in delivering information to their students and therefore found computers as a relevant teaching tool. As a result, students found this technology useful in storage and retrieval of information and believed that this learning tool provided greater accessibility and convenience. In a study in Japan, 333 university students were interviewed regarding their use of computers. All students reported owning a computer, out of which 99% send e-mail on their computers. Students use computer technologies to support educational experiences, in that 66% of them e-mail their peers about classes and 44% e-mail for studying (Thornton & Houser, 2005).

Chen and Chung (2008) considered the effectiveness of computers in improving English learning of Taiwanese students and assessed the attitudes of students towards usage of computers for English learning. In addition, Cuing and Wang (2008) noted that universities in United Kingdom are using computer technologies in order to store and retrieve information such as electronic books and educational materials hence making learning practices more successful. In another study, teachers were offered strategies on how they could simply convert educational materials into e-books, multimedia resources or interactive exercises with the aim of being utilized on a number of different computers (Lam et al, 2011). This study found that teachers were eager to find new methods in presenting information to their students and therefore found computer as a relevant teaching tool.

**The use of computer technologies on students' academic performance.**

Students who use technology in learning attain higher academic success (Chase &Herrod, 2005). Kulik (1994) study showed that, on average students who used ICT-based instruction were likely to score higher than students without computers did, when science students are engaged in real-world activities that can actually represent the concepts, they are learning about it can actually present a means of modifying and simplifying learning. Computer technologies can make students hopeful in reflecting their learning and considering its relation to the world around them (Waycott& Kennedy, 2009). This is very essential for science learning, because it involves increasing knowledge about complicated concepts, which in turn can be more significant if students are able to construct a relationship between their formal knowledge and their personal experiences (Vavoula*etal*, 2007).Zurita and Nussbaum (2004) conducted a classroom experiment that compared the ability of two groups. Each group consisted of 12 Spanish primary school children. These students" constructed Spanish words presented to them through either PDAs or printed 56 cards. The results revealed that those students from the PDA group had significantly higher test scores on constructing words than those from the printed card group. It was also found that PDAs took less time on the task and used less teacher support (Zurita& Nussbaum, 2004).

Computers are becoming increasingly important in our daily lives as well as in educational systems (Demirci, 2009). Although computer technology has agreat potential to reform or even transform education, a study by Lim and Khine (2006) reported that educators believed that the mere use of computers in their lessons excited and motivated their students to learn.

Moreover, the adoption of Computers by education has been seen as a powerful way to contribute to educational change, better prepare students for the information age, and improve learning outcomes

and competencies of learners, and equip students with survival skills for the information society.

Akçay, Durmaz, Tüysüz, andFeyzıoğlu (2006) conducted research using the students from Dokuz Eylul University to examine the effects of computer based learning on students' attitudes and achievements towards analytical chemistry. They concluded that the attitudes and grades of the students are better with technology and a multimedia application for graphs and questions is more attractive than traditional teaching, especially the use of animation and sound effects. Their study showed that simulation saved money and time; it also showed that students who hesitate to study with computers abstain from business life after university education.

Hunley, Evans, Delgado-Hachey, Krise, Rich, and Schell (2005) conducted a study to find out the relationship between adult computer use and academic performance. They used questionnaires and seven-day time logs to gather data from 101 tenth-grade students in three high schools in southwestern Ohio. The results showed no statistically significant relationship between time spent on the computer at home and grade point average, nor were there significant relationships between grade point average and the amount of time spent on homework or going out with friends.

Yildirim and Fakültesi (2006) conducted a research on second-year pre-service teacher education students in Turkey to find the impact of hypermedia authoring on knowledge acquisition and retention. Forty-eight

second-year pre-service computer teachers who enrolled in "Instructional Technology and Material Preparation" participated in this study. Their results showed that the use of hypermedia as a cognitive tool resulted in a similar level of student achievement as those who were enrolled in traditional instruction. They concluded that Turkish students had been exposed to traditional teaching for a long time. They were not used to the technology way of teaching

Johnson (2000) used the data from the 1998 National Assessment of Educational Progress (NAEP) database by the National Center for Education Statistics (NCES) of the Institute of Education Sciences, U.S. Department of Education to analyze the influence of computers on academic achievements for fourth, eighth and twelfth-grade students. Johnson reported that students with at least weekly computer instruction by well-prepared teachers did not perform any better on the NAEP reading test, and concluded that computer usage was negatively related to academic performance and computers had little effect on teaching practices or classroom activities. However, Hedges, Konstantopoulis, and Thoreson (2003) argued that there were some weaknesses in the design of the NAEP database which influence the analysis. The measurement of key variables in the NAEP database is weak and NAEP is a one-point-in-time cross-sectional survey. They recommended that the question design of NAEP database should be improved and they should consider developing teacher questionnaire items that would obtain information about the specific computer software and hardware used.

**Teachers and Students Satisfaction with the Use of computer Technologies in teaching and Learning Science**

According to(www.wikipedia.com). Satisfaction is the feeling of pleasure or disappointment achieved from evaluating a perceived performance (outcome) in relation to a learners expectations. If the performance falls short of expectations, matches the expectations or exceeds expectations then the student or teacher is either dissatisfied, satisfied or highly satisfied. According to Muhammad et al (2011), the results of a study revealed that students and teachers can use computer technologies for exchanging relevant information with their peers. This technology assisted in improving students‟ academic performance. The level of the quality of education increased, since crucial and helpful information was conveyed to their peers. Students were observed to be using the dictionary, thesaurus and calculator that were available on their computers. Students therefore felt highly satisfied (Muhammad et al, 2011).

Through computer technologies, teachers and students are able to disseminate, combine, and share information easily and conveniently. As a result there is more encouragement and collaboration among teachers and students. Collaborative learning activities encourage teamwork. These activities involve teachers and students coming together to work on a particular theme, where they brainstorm, question and contribute to a compilation of materials on a topic. This may include newsgroups, email, web pages and video-conferencing (iEARN Australia Collaborative Projects, 2002). Additionally, Stead (2004) states that in m-learning projects, students that engage most in collaborative activities gain more learning experiences either by sharing technologies or by transferring data between computers Business college teachers and students in

a large urban university were surveyed to determine whether the introduction of laptops contributed to student academic performance, student academic satisfaction and constructivist teaching activities (Wurst et al, 2008). The first year group of students did not have laptops while the second and third year group of students were given laptops by the university. The results showed that students observed their learning environment to be more constructivist than their traditional classrooms. Students with laptops reported no statistical improvement in student achievement as measured by GPA and statistically less satisfaction with their education as compared to students with no laptops (Wurst et al, 2008). Two classes (120) of nursing students had their exam scores compared, where the 2007 class had content presented in the traditional lecture format whereas the 2008 class had the same content presented through podcasting (Vogt et al, 2009). Both techniques used the same lecturers and examination questions. The results showed that there was no significant difference in correct responses on examination questions between the traditional lecture technique and podcasting. Examination scores were improved with the first podcast, same for the second, but got worse with the third podcast. Students were generally satisfied with the experience of using podcasts and remarked positively on its convenience. Therefore, podcasting can have a positive impact on student's satisfaction (Vogt et al, 2009).

Wu and Lai (2009) observed that PDAs were used in a clinical nursing course where students recorded information, organized ideas, assessed patients and interacted as well as collaborated with their classmates during clinical practicum. This mobile technology

provided students with the opportunity to enhance their learning and also facilitate peer cooperation and interaction with their instructor (Wu & Lai, 2009). In another study conducted by Alzaidiyeen et al (2011), 250 students participated. The results of this study showed that attitudes were significantly different according to students‟ gender. Males‟ attitudes in the use of PDA‟s were significantly higher than females. But, in terms of age, there was no significant differences found in students‟ attitudes towards the use of PDA. Hence, PDAs can have a positive influence on students‟ learning.

**Barriers in the Use of computer technologies in Science Learning**

Integration of computer technology into teaching and learning of science in order to prepare students for the present economic conditions is gaining more and more importance in Ghana. Therefore, Ghana has enthusiastically set a number of goals in order to improve its education system. While the efforts concerning realization of computer technology integration in schools are on going, it is necessary to identify the problems, experienced during this process and to develop appropriate ways in order to solve these problems. Lai (2001), distinguishing barriers to the Computer technology integration into the teaching/learning process, describes them in a more detailed and structured way: Lack of competencies, Limited accessibility, Lack of support, Shortage of time for developing materials by using computer, Lack of training, lack of hardware. According to Earle (2002), compute technology integration will not be insured by only providing hardware and software and establishing infrastructure. Similarly, Hew and Brush (2007) asserted that beside lack of hardware and software, insufficient opportunities to access to these resources

will decrease the chance of teachers to integrate technology into teaching programs.

1) **Lack of competencies.**

Pedagogical content knowledge (PCK) has long been discussed as crucial for effective teaching (Shulman, 1986). Effective educators must not only be domain experts,but also understand how to flexibly use the affordances of different pedagogies for particular content topics. With the advent of numerous novel technologies over the past decades, educators have an abundance of technologies to leverage to make their teaching more effective. Although the potential benefits are clear, the sheer number of possible combinations of technologies and pedagogies for different tasks and students is overwhelming. The TPACK framework expands on the focus of PCK to also include technology as a knowledge domain (Mishra & Koehler, 2006). TPACK focuses on technology, pedagogy, and content knowledge individually, and also on their interactive combinations; this leads to a sum of seven types of knowledge that TPACK supporters argue are crucial for ideal integration: content knowledge, pedagogical knowledge, technological knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and technological pedagogical content knowledge

How can the TPACK framework be useful? It has been conceptualized in different ways, but most relevant for our current discussion is that it is often viewed as the complete set of knowledge necessary to teach with technology (Mishra & Koehler, 2006). Thus, a goal is to promote these knowledge domains; clearly, most of these knowledge domains are already heavily

emphasized during teacher training and professional development (e.g., mastering the content in which a teacher specializes).

Hargreaves (1994) and CEO Forum (1999) claim that information and communication technologies will be efficiently used in lessons only if teacher qualification development will be oriented specifically to the needs of the Limited accessibility

Early accounts of technology integration focused much of their interest on increasing the availability of computers in schools (Fisher, Dwyer, & Yocam, 1996). Certainly, the most basic step toward effective technology integration is widespread access to equipment necessary to run educational computer programs. If computer lab time is limitedtoone hour per week, persistent use of educational technology is not viable. While many schools across the country are making the transition to one-to-one (1:1) computing (Warschauer, Zheng, N+iiya, Cotton, & Farkas, 2014), many students do not have regular and reliable access to a computer. Inconsistent computer access makes it extremely difficult for teachers to integrate technology into existing lesson plans. Routine access to hardware (i.e., laptops or tablets), software (e.g., reading and writing software, internet browsers), and internet connection is a fundamental requirement. Research demonstrates that much progress had been made to improve equipment and internet access in schools over the last 20 years. Results from the National Center for Education Statistics' (NCES) 2009 survey of public school teachers revealed that 97% of all teachers have at least one computer in their classroom every day (Gray, Thomas, & Lewis, 2010). Compare this result to the 1999survey which found that only 84% of public school teachers had computers available in the classroom (Smerdon,

Cronen, Lanahan, Anderson, Ionnotti, & Angeles, 2000). The 2009 results indicated that, on average, classrooms had 5.3 students to every computerin the classroom (Gray et al., 2010). Results alsoshowed that 93% of classroom computers had internet accessby 2009 (compared to 64% in the 1999 survey; Smerdon et al., 2000). These results demonstrate that, by the year 2009, the ideal 1:1 computing model had not been broadly realized, but computers are widely accessible in the modernclassroom.

Lack of qualification development is not the only barrier to the integration of technologies into the teaching/learning process. Lawton (1994) notes that accessibility is one of a number of problems. If the teachers are required to use such resources as information and communication technologies, they must have access to these technologies. It is also very important that these technologies function in an indefectible way, i.e., it is important to make overall technical provision (Lai 2001).

**2) Lack of support**

Though we cannot say for certain how the future will impact professional development, but it is clear that science teachers of today do not have optimal access to technological support. According to U. S. Department of Education (2010), 68% of school districts reported having adequate support for educational technology. While it is encouraging to see that the majority of responding districts feel that they have access to adequate support, there is clearly more room for improvement. Withadditional technology support, science teachers can worry less about technological barriers and instead focus on teaching their students. Adopting a new educational technology can be a time-consuming process. If a technology is adopted school-wide, teachers

should haveaccess to extended support from trained professionals, as opposed to a single hour long meeting before the school day begins. Of course, this will most likely require dditional funding for schools, but creators of educational technologies should also place increased emphasis on user support. With high quality support from both creators of educational technologies and school employees, science teachers will have access to the resources they deserve. The knowledge that support is readily available may in turnincrease acceptance of classroom technologies. Ertmer (1999) stated that the most essential form of support to teachers can change as the technology integration project matures. During the earlier phases of a project, teachers require more technical support justto use the new technology, which could be accomplished by hiring educational technology and information technology professionals. As teachers become more proficient in the technical skills required for the new technology, their needs may shift to administrative and peer support to help develop and apply new uses for the technology in their classrooms. This type of support may be provided in professional learning communities through regular discussions regardingnovel, domain-relevant uses of the technology.

Means and Olson (1995) assert that easily accessible technical support (maintenance of computer hardware and intranet infrastructure) is an important factor in the school change, integrating constructivist education and information and communication technologies at school. The authors remark that teachers will have no intention to use technologies if they feel they can encounter technical problems (not working software, hardware problems etc.) that can only be repaired in several days.

However, teachers need not only technical support to be able to use information technologies in the teaching/learning process. According to the research data by Ringstaff (1995), teachers, supported and motivated by the school principal, used information and communication technologies more during their lessons in comparison with those who did not receive support from the school administration.

School principal support is very important as technology integration into the school is related with resource redistribution, purchase of the new equipment, teaching schedule reconsideration,

Technology in itself is not an end to education but a means for improving it. Muriithi (2005) has argued that in Kenya, like most developing countries, Computer usage is still limited to literacy training

3) **Classroom barriers to technology integration**

Ertmer (1999), stated that even with first-order barriers removed, computer technology would not immediately appear within all classrooms using appropriate pedagogy. Individual teachers and students are responsible for using technology, and thus even when given adequate resources, they have choices about how to use technology. Classroom barriers to computer technology integration vary from teacher to teacher these issues are, by their nature, personal, even within the same environment. Consequently, If teachers and students do not expect new technology to be useful or do not think they have the required experience to use such technologies, they are more likely to persist using more traditional methods. Closely related to the attitudes and beliefs, teacher resistance may presenta barrier to technology integration.

Teachers' attitudes and beliefs are crucial factors in determining the role and effectiveness of technology in classrooms. Attitudes and beliefs about both educational technology and pedagogy in general will ultimately influence how teachers implement technology. Now that technology is being widely used in schools, perhaps the most important question is how to best implement technology, rather than whether technology will be used (Ertmer, 1999; Ertmer et al., 2012; Keengwe, Onchwari, & Wachira, 2008; Lowther, Inan, Strahl, & Ross,2008).

**4) Hardware and Software Availability**

Ginsberg and McCormick (1998) and Naimova (2008) conducted a research. 1163 teachers participated in this study and the purpose was to show the barriers teachers encounter in using computers. The findings obtained from this study indicated that the most serious barriers influencing the implementation of computer technology are computer hardware. Teachers reported that the limited number of computers and printers was their main concern. The hardware factor is related to the barrier of accessibility. An important strategy for decreasing the student-to-computer ratio is computer lab. Some teachers lack enough time in the computer lab and this causes them not to use computer technology appropriately in teaching. The subject being taught dictates accessibility to computer hardware. The position of computers and the accessibility of students to them are two barriers to teachers who are implementing computer technology (Middleton, Flores, & Knaupp, 1997).

The second problem is that it is very difficult to do scientific activities in a computer laboratory. These tasks need more tools than staff members can do in a room. The third problem is pertinent to the limitations of computer

labs. According to Middleton, Flores, and Knaupp (1997), computers should be placed in classrooms so that students can get access to them and use them in meaningful and practical ways. The barrier of restricted access impedes the real use of computer technology in instruction. A significant element to the diffusion of computer technology is the use of hardware and software resources (Gülbahar, 2005). Computer technology can be utilized by teachers in their educational procedure. This may appear when they see the capability of on-line classes and the chance of making net-based instructional subjects. So, hardware, software and web structures are necessary for integrating computer technology in education (Richardson, 2000).

A study was carried out by Albirini (2006) towards investigating the elements connecting to teachers' attitudes about information and communication technologies. A questionnaire was developed to gather information about teachers' understanding of computer qualities, cultural realization, computer knowledge, computer disposal, and individual features. 63 male and 251 female teachers took part in this study. The findings obtained from this study indicated that 57% of the respondents had computers at home while only 33.4% of the respondents had computers at school. This result indicates that computers are not enough for teachers. It was concluded that computer access is one of the serious obstacles to the usage of computer. Mumtaz (2000) stated that lack of funds is one of the main causes that prevent teachers from using computer in their instruction. A report was issued by Mumtaz (2000) regarding teachers' utilization of computer. It indicated a relationship between access to computers and the application of computers. Instructors who had computers in their classes used them in teaching than

those who lacked; 50% of teachers who had computers in their schools applied them to inquiry and activities relevant to the provision of their lessons. 78% of teachers stated that restricted access to computers is a barrier to the effective use of computers in their classes. It can be stated that the practical application of computer depends upon the availability of hardware and software for both teachers and students.

**5) Time Factor**

The time factor is one of the major barrier in the usage of computer. Teachers do not like to use computer technology because it can shorten learning time for learners. The actual time spent for teaching and learning is not enough for teachers and this may stops them using the computer technology (Roszell, 1995). 29 conditions were identified by Roszell (1995) that influenced the usage of computer in teaching. The results indicated that one of the most important conditions impacting teachers' readiness to include technology in their education is the lack of time for developing lessons that use computer technology. Lack of time is a barrier that stops teachers using computer technology (Mumtaz, 2000). This barrier appears in two methods: (a) Release time and (b) scheduled time. A research was done by the U.S. Department of Education and National Center for Education Statistics (2000). Findings obtained from this study showed that 82% of the participants believed that insufficiency of release time stopped them practicing computer technology in their classes. Teachers said that with their scheduled classes, they lacked sufficient opportunities to practice applying computer technology in their classes. Nearly 80% of the teachers stated that there was not enough

time scheduled for their students to utilize computers. It can be stated that the lack of time needed to use computer into the syllabus is an important subject.

**Improving technology through Education**

Technology is helping teachers and students to expand beyond linear, text-based learning and to engage students who learn best in other ways. The role of technology in education has in schools has evolved from learning about computers into a versatile learning tool that could change how we illustrate ideas and concepts, assign projects and assess student progress.

Despite these opportunities, adoption of technology by teachers and students in schools is still anything to write home about, U.S. schools are still asking if they should incorporate more technology, while other countries are asking howcomputer technologies can be incorporated into teaching and learning (Knezek). Computer technology has shown great potentials in improving education in the following areas

**Better Simulations and Models**

A simulation is an instructional strategy that offers the opportunity to learn in a realistic environment and practice problem solving skills without danger. Rothwell and Kazanas (1999) define a simulation as an "artificial representation of real conditions". Tuning fork is a perfect and acceptable way to show how vibrations make sound, but it is harder to demonstrate to students how evolution take place, how molecules behave in different situations, why combining two particular chemicals is dangerous. Digital simulations and models can assist teachers explain concepts that are too big or too small, or processes that happen too quickly or too slowly to students in a physical classroom.

A very powerful non-profit organization called Concord Consortium develops technologies for math, science and engineering education, has been a leader in developing free, open source software that teachers can use to model concepts. One of their most extensive projects is the Molecular Workbench, which provides science teachers with simulations on topics like gas laws, fluid mechanics and chemical bonding. Teachers who are trained in the system can create activities with text, models and interactive controls. One participant referred to the project as "[Microsoft] Word for molecules." Other simulations the organization is developing include a software that allows students to experiment with virtual greenhouses in order to understand evolution, a software that helps students understand the physics of energy efficiency by designing a model house, and simulations of how electrons interact with matter.

1. **Efficient Assessment**

Beyond being, a powerful tool for teaching concepts, Models and simulations can also give teachers a much richer picture of how students understand them. Dorsey (2008) said that You can ask students questions, and multiple choice questions do a good job of assessing how well students have picked up vocabulary. The fact that student can describe the definition of a chromosome doesn't mean that they understand genetics any better, it might mean that they know how to learn a definition. But how do teachers get to know that students understand concept?"

In Geniverse, a program the Concord Consortium developed to help students understand genetics by "breeding" dragons, teachers can give students a problem that is much more like a performance assessment. The students are

asked to create a specific dragon. Teachers can see what each student did to reach his or her end result and thereby understand whether trial-and-error or actual knowledge of genetics leads to a correct answer. The organization is also developing a program that will help teachers collect real-time assessment data from their students. When the teacher gives out an assignment, she can watch how far along students are, how much time each a spends on each question, and whether their answers are correct. With this information, she can decide what concepts students are struggling with and can pull up examples of students' work on a projector for discussion. computer technologies enables high quality output to be produced at a speed that cannot be matched using the conventional methods and resources. Teaching applications such as graphing packages in mathematics, multimedia authoring software and data analysis packages in Geography and science all allow students to work much faster than if they had to do the task manually. Morgan and Tidmarsh (2004) studied a work of a Geography teacher using computer technologies in their lessons; they describe the advantages of using ICT as a tool to increase the breadth and speed of learning, increasing the efficiency of both teacher and students. ICT was used to gather, analyses and present information. This reduces time where one wants to analyze information

1. **Increased Motivation**

Studies have shown the motivating effect of using computer technologies by teachers in schools and the positive impact it can have on students attention and effort in class, Trimmel and Bachman (2004) studied the impact of introducing laptops into classrooms and one of their conclusions was that computer technology has a positive impact on school attendance and

learning interest: The DFES (2003) conducted research on a number of projects to support it's statement that computers can play an important role in motivating students and encouraging them to engage in learning within and beyond the classroom." The ICT objectives were useful in their own right as it is a key element of the ICT curriculum that students learn how to present information in a professional way. Most students enjoy working on computers, and that makes it more motivating. Whilst student enjoyment is an important factor in education, we must pay particular attention to the curriculum so that we can plan how to include computer technologies into our teaching and learning of science.

**2. Learning Independently**

The internet has a big impact on student academic performance. The use of the internet has a huge impact on student achievement. Teachers and Students need the internet more than other people due to their research in educational or need, teachers and students use the internet as a research tool for finding their own information. John and Sutherland (2004) describe the way in which the internet can be used in Geography to develop a "digital earth" concept to enhance students understanding of many aspect of subject. The internet is often used to support text books at lower cost for instance "a Secondary School Art class uses the internet extensively for research and gathering ideas, and even interacting directory with contemporary artists via their websites" (Becta 2001).

**Theoretical Framework**

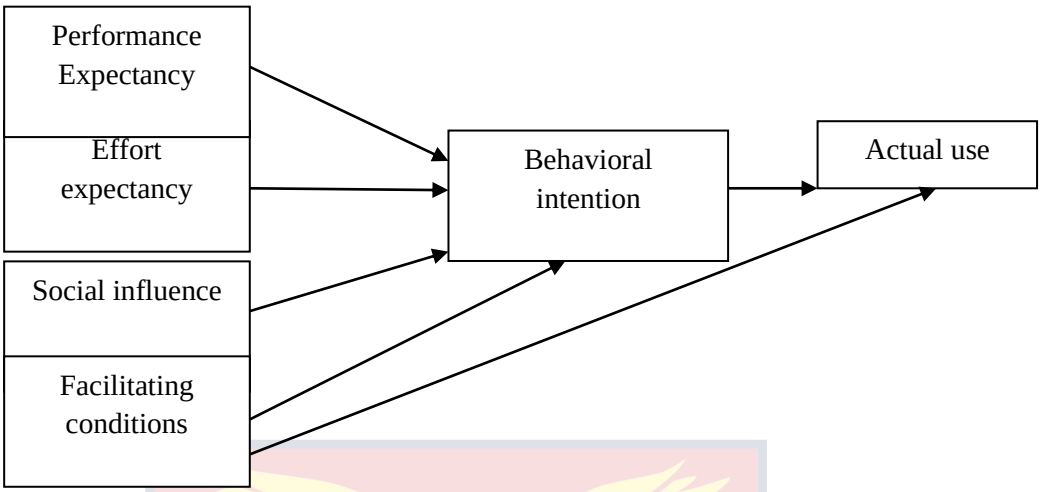


*Figure 1: Theoretical Framework*

The research was based on the Unified Theory of Acceptance and Use of Technology. The Unified Theory of Acceptance and Use of Technology (UTAUT) state that four constructs play a significant role as direct determinants of user acceptance and of usage behavior: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy is defined as "the degree to which both teachers and students believe that using the system will help them to attain gains in job performance". Effort expectancy is defined as "the degree of ease associated with the use of the computer technologies". Social influence is defined as "the degree to which an individual perceives that other important people believe he or she should use the new system". Facilitation conditions are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system".

According to Bates (1995), there is a need for major changes in the education system in order to meet the need for a higher skilled workforce. Countries that inculcate the use of computers and telecommunication in

education will soon be economic leaders of the 21st century. Teachers who take the initiative to upgrade their skills may require as many as five years to master computer technologies Sheingold and Hadley (1990). While Van Ben Berg and Ros(1999) reports that in 40% of schools involved in the many large-scale innovation projects in Western Europe that they have examined,the majority of teachers have not progressed past the middle level of self-concern three years after technology introduction.

Generally, the technologies that are easy to use or are user friendly tend to be more accessibleto teachers and learners because they seek them out willingly. Teachers and learners seek a technology that is versatile with many functionssuch as the computer.

**Conceptual Framework**

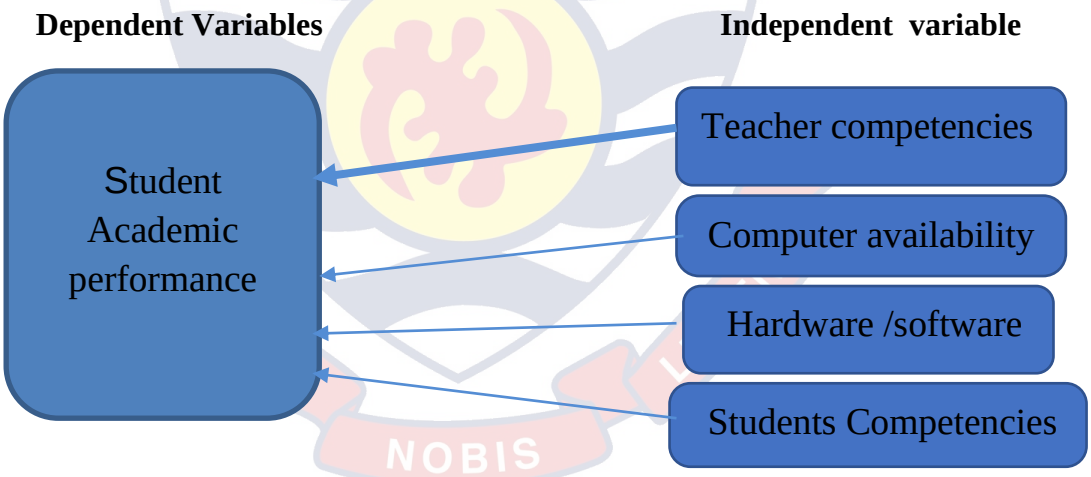


*Figure 2: Conceptual Framework*

Source: researcher's own

In building the conceptual framework**,** the researcher tried to find out the relationship that computer technologies have on students' academic performance.

This conceptual framework has identified the independent variables as; teacher competencies, computer availability, connectivity, Hardware and

software. This independent variable is influenced by the extraneous variables of geographical and family background, which will bring about the expected outcome of this study which would increase student academic performance, availability of computers in school, increased class participation and an increased level of use or integration of computers in teaching and learning.

There is some evidence that students and teachers would respond enthusiastically to the use of novel technologies in learning (Osondo et al., 2010). Bates (1995) discredits any novelty in print materials in favour of the computer technology novelty that attracts learners but also realises that computer instructional design in the different areas of education remain critical for educational success. This newness of the computer technology may result in an improvement in student satisfaction and learning outcomes (Reid & Rushton 1985). Candau et al. (2003) appear to support Bates' user friendliness and interactivity of the computer technology when they talk about creating a participatory learning environment.

In writing their book,Candau et al. (2003) wanted to help teachers employ the power of computer technology to spark students' imagination and ultimately move them towards greater learning experiences. Their goal was to help teachers learn how to use the technology to expand the possibilities for learners in the classroom and effectively create learning environments that provide vast opportunities for students. Murdock &Desberg (1994) support Bates' model too when they say that students could use computers to help them break out of the walls of the classroom to share and have access to all the wonderful information and experience that is now possible.

# CHAPTER THREE

# RESEARCH METHODS

## Introduction

This chapter describes the general procedure adopted to collect data for the research design, population, sample size and sampling techniques, research instruments, procedure for data collection and procedure for data analysis.

## Research Design

A research design is the architecture of the whole work that the researcher intends to use to carry out the business of the research. Burns and Grove (2001, p. 233) state that designing a research helps the researcher to plan and implement the study in a way that will help the researcher to obtain intended results, thus, increasing the chances of obtaining information that could be associated with the real situation.

The researcher used descriptive research design. This design was preferred because it is concerned with answering questions such as who, how, what, why, which, when and how much. According to Aggarwal (2008), this type of research is devoted to the gathering of information about prevailing conditions or situations for the purpose of description and interpretation. This method was appropriately used to enable the researcher analyze the objectives of this study tentatively and also the validity and reliability of the result of the findings. This type of research design reports things the way they are and attempts to describe such things as possible behavior, attitudes, values and characteristics.

Descriptive study, according to Busha and Harter (1980) has the capacity of collecting background information and the researcher would not be able to

have the opportunity to motivate or influence respondents' responses. Sproull (1995) and Iddrisu (2009) recommend the survey technique for research where attitudes, ideas, comments and public opinion on a problem or issue are studied. The descriptive survey design approach was used for the study because computer technology is an innovative learning tool, which makes it vital to gather information on how this technology can be used to support teaching and learning of science.

**The figure 3 below shows the Research design and plan**

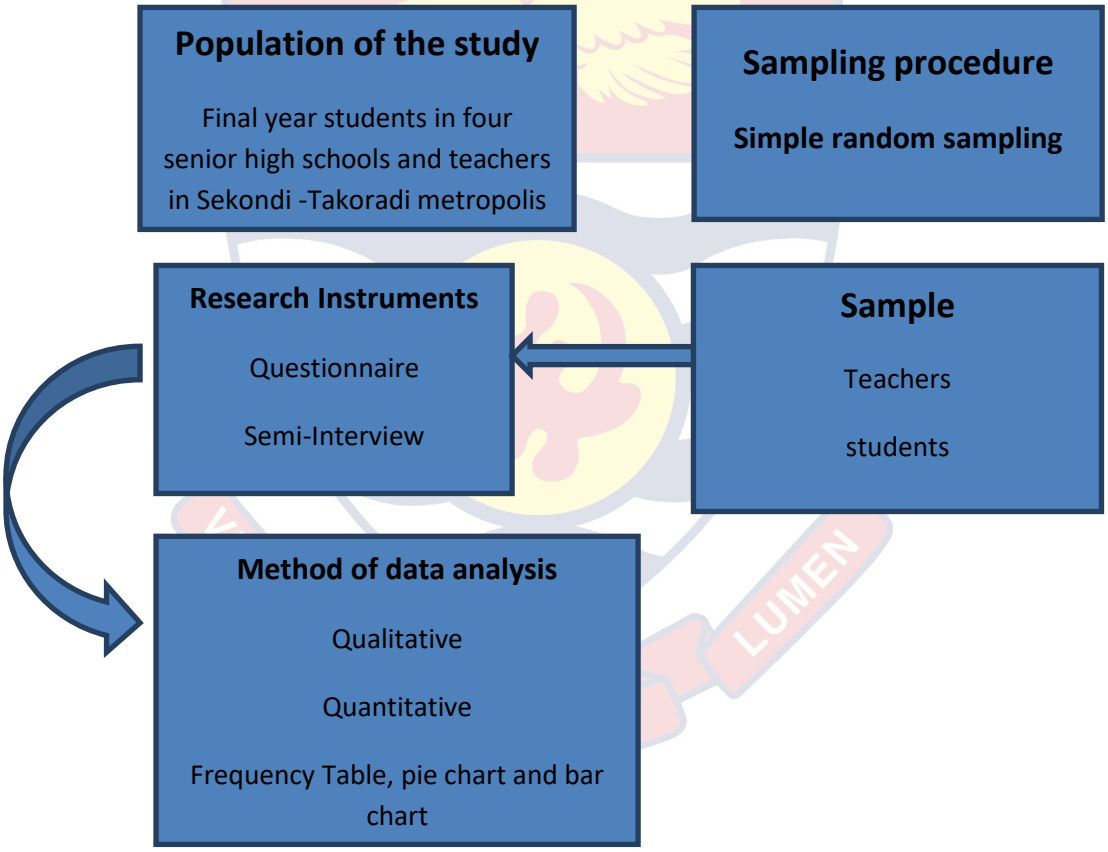


*Figure 3 Research Design and Plan*

**Population of the Study**

Borg et al (1983) defined research population as all the members of a real or hypothetical set of people, events or subjects to which the researcher wishes to generalize the result of the research. The population for the study is

the students and teachers in (Sekondi College, Ghana Secondary Technical School, Fijai SHS, and Archbishop Potter Girls' SHS) and the accessible population will be all final year Science students.

Final year students will be used in this research because it is expected that they have reached some level of proficiency in the use of computer technologies and also have gone through a large volume of work which involved the use of computers.

**Sample / Sampling Procedure**

The formula that was developed by Yamane (1973) for calculating sample size will be used to calculate the sample size. The formula is shown below:

$$n = \frac{N}{1 + N(e)} 2$$

n = is the required sample size.

N = the population size

e = Tolerable error (which in this study was pegged at 0.05).

Simple random sampling will be used in selecting the respondents from the various schools, because it affords all the members under consideration an equal chance of being selected.

**Research Instruments**

This refers to the tools the researcher used to gather information. In this research, questionnaire and interview were the instruments employed.

**Questionnaires**

For this research, questionnaire wasused as the main instrument. The questionnaire was adapted and modified from Rodden (2008). The questionnaire was made up of respondents, age, gender, level, and questions

relevantto solicit answers for the objectives of this research. The majority of the questions posed, were closed-ended questions, although some questions will allow open responses for respondents to express themselves without limit.Two instruments were used, namely: Questionnaire for Students‟ (QfS) and Questionnaire for teachers (QfT). It was administered to science students and teachers in four senior high school in Sekondi Takoradi. These question items helped to gather information on how students and teachers use computers in their learning. The QfS was used in order to collect quantitative data from students and teachers. Both the QfS and QfT measured the reliabilities of types of computer technologies, satisfaction and performance.

**Semi-Interviews**

In addition to the questionnaire, a semi- structured interview was also used as a method of probing respondents to give detailed explanations to the questions asked. The nature of a semi-structured interview allows the researcher to take advantage of the flexible nature of the qualitative research aspect of the research type by being able to change the line of questioning should an interviewee offer a pool of knowledge or opinion on an unexpected subject. This differs from both structured interviews, similar to questionnaires, which are primarily used for gathering quantitative data.

**Methods of Data Collection**

Both primary and secondary data were used. Primary data is information gathered directly from the respondents and the secondary data is information gathered from studies done by others, according to Mc Leod (2014), data collection is a formalized set of questions for obtaining information from respondents. The objective is to translate the researchers

information needs into a set of specific questions that respondents are willing and able to answer. Questions may results in diverse and unanticipated responses.

**Primary data**

Primary data collection includes raw data that was collected from the students and teachers through distributed questionnaires. The researcher personally administered the questionnaires to the respondents. The questionnaires were distributed to the randomly selected students from the various department and the teachers towards answering the research questions and objectives. The primary data formed the heart of this study because it afforded the opportunity for the researcher in obtaining at first-hand, responses from the various respondents. Tape recorder was also used to record one-on-one interviews conducted on the students and the teachers. The questionnaire and interview guide can be found in pages ---------

**Secondary data**

The secondary data for the study were sourced from relevant literature including journals, conference proceedings, and other documents existing in the public domain. Information from these sources helped inputting the current research in context and as well provides part answers to the research objectives. Collection of secondary data was obtained through desk research, which was either from internal or external sources the external sources included publications, press, newspapers, libraries, and various research related organizations.

**Data Analysis**

Data analysis is aimed at fulfilling the research objectives and provided answers to the research questions. For the collected data to be understood by the common person easily, it needs to be analyzed. The research will use qualitative and quantitative techniques in analyzing the data. After receiving the questionnaires from the respondents, the responses were edited, classified, coded and tabulated.

Tables and charts were used for further representation for easy understanding and analyses. The collected data will be thoroughly examined and checked for completeness and comprehensibility. The data will then be summarized, coded and tabulated.

# CHAPTER FOUR

# DATA ANALYSIS AND DISCUSSIONS

## Introduction

This chapter focuses on the analysis of the data and its discussions on the effect of computer technologies on the academic performance of science teachers and students with a particular reference to Sekondi Takoradi Metropolitan Assemble (STMA). In analyzing the data, the responses from the teachers and the students were analyzed separately to find out their views about how computer technologies affect academic performance, the availability and use of computer technologies. The data collected has been organized into tables, pie chart, and bar graph to illustrate and support the analysis.

## Analysis of background characteristics of respondents

This section sought to find out the characteristics of the respondents. The issue of interest to the researcher includes age, gender, highest level of education, name of school, and teaching experience. A number ofrespondents were involved in this research and consisted mainly of teachers and students from selected schools in Sekondi Takoradi Metropolis Assemble (STMA).

**Table 1: Distribution by Gender (Teachers)**

| Respondents | Frequency | Percentage |
|---|---|---|
| Male | 30 | 66.7 |
| Female | 15 | 33.3 |
| TOTAL | 45 | |

From the table above, it can be seen that out of the forty-five (45) teachers who took part, thirty (30) representing 66.6% were males whiles

fifteen (15) of them representing 33.3% were females. It can be concluded that more male teachers toke part than female teachers

**Table 2: Distribution by Gender (students)**

| Respondents | Frequency | Percentage |
|---|---|---|
| Male | 135 | 45 |
| Female | 165 | 55 |
| TOTAL | 300 | |

iHub Research Department (2012) conducted a study on the usage of mobile internet in Ghana with about seven hundred and ninety-eight (798) respondents who were receiving lower income. Majority of the respondents were male. Gender balance can be an important aspect of study. From table 2, one hundred and thirty-five (135) out of the three hundred (300) students' respondents representing 45% were males whiles one hundred and sixty-five (165) students respondent out of the three hundred (300) respondents representing 65% were females. The higher number of females was as a results of higher number of females in our secondary schools.

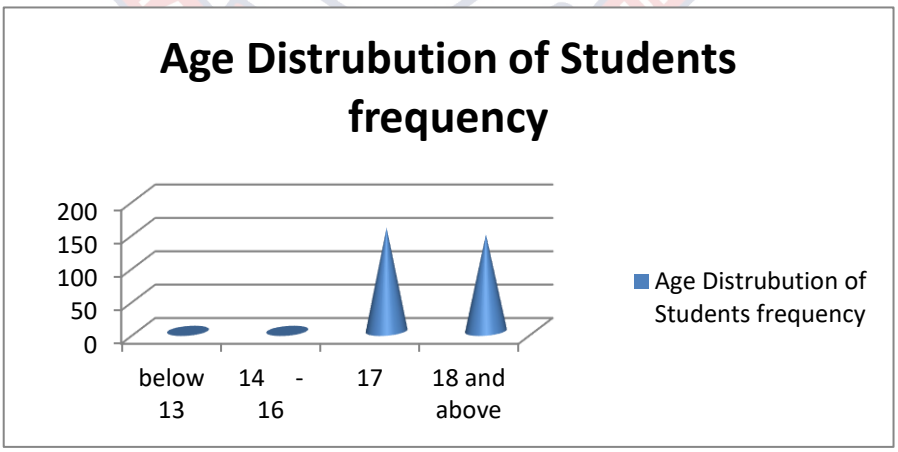


*Figure 4: Age distribution of students*

From figure 4, one hundred and sixty respondents representing 53.3% were 17years, the sharp rise in ages in the SHS is due to the resit and the free SHS that has been introduced. more than one hundred and forty (140) representing 46.7% were 18 and above,

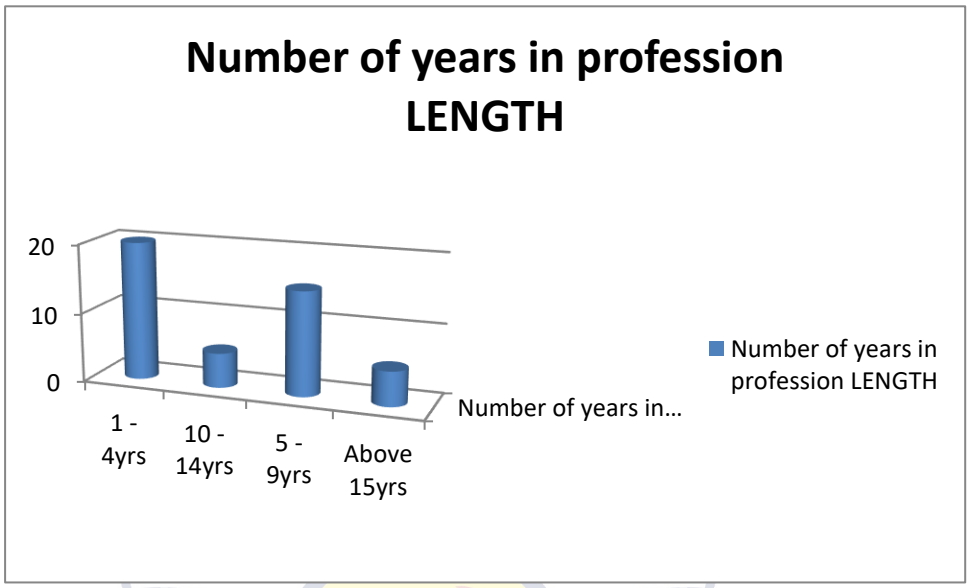


*Figure 5: Teaching experience*

From figure 5, it can be seen that eighteen (18) respondents representing 40% have spent from one to four years in teaching, six (6) respondents representing 26.7% have spent ten (10) to fourteen (14) years in the school, fifteen (15) respondents representing 33% have spent five to nine years in teaching, six (6) respondents representing 26.7% have spent more than fifteen years teaching. An inference from the above is that majority of the respondents have spent more than five (4) years as teachers.

**Table 3:Highest level of Education of teachers**

| Response | Frequency | Percentage |
|---|---|---|
| HND | 6 | 13 |
| First Degree | 30 | 66.7 |
| Masters | 9 | 20 |
| Total | 45 | |

From table 5, thirty (30) out of the forty-five (45) respondents representing 66.7% were first degree holders, six (6) out of the forty-five (45) representing 13% were HND holders, nine out of the forty-five (45) representing twenty 20% were masters degree holders. From the table, it can be said that majority of the people the study interacted with were first-degree holders.

**Analysis of Main Data**

**Research question one: What are the barriers preventing the integration of ICT in education in the Senior High Schools in the Sekondi - Takoradi Metropolis?**

Here we will be looking for responses fromstudents on the barriers of using computers in their laboratory Respondent views are shown in table 9.

**Table 4: Factors preventing studentfrom using computers in the laboratory to learn.**

| Responses | Number of Responses | percentage |
|---|---|---|
| Lack of time to use computers | 85 | 33.3% |
| Lack of knowledge about computers | 100 | 28.3% |
| Lack of confidence | 45 | 15% |
| Fear | 55 | 18.3% |
| Little previous knowledge | 90 | 33.3% |
| Computers not accessible | 12 | 36.7% |
| Computers not available | 95 | 40% |
| No support if something goes wrong when using computers | 135 | 61.7% |
| I know how to use computer but have no idea how to integrate it into my learning | 200 | 66.7% |
| Computers will distract my attention in the classroom | 10 | 3.3% |

From table 6, two hundred (200) students' respondents representing 66.7% stated that they know how to use computers but have no idea on how to

integrate it into their learning, ninety students (90) representing 33.3% stated that they have little previous knowledge on how to use computers in the laboratory. One hundred and thirty-five students representing 61.7% stated that there is no help if something goes wrong,Eighty-five (85) representing 28.3% stated that lack of time to use computers in the laboratory is what is preventing them from using computers in the laboratory, forty-five (45) students respondents representing 15% stated that lack of confidence is what is preventing them from using computers for learning, fifty-five (55) students respondents representing 18.3% stated that fear is what is preventing them from using computers, one hundred students respondent (100) representing 33.3% stated that little previous knowledge in the use of computers is what is preventing them from using computer in the laboratory, one hundred and ten (110) students respondents representing 36.7% stated that accessibility of computers in the school is what is preventing them from using computers, one hundred and twenty (120) students respondents representing 40% stated that lack of availability of computers in the school is what is preventing them from using computer in the laboratory, ten (10) students respondents representing 3.3% stated that computers distract their attention preventing them from using it in the laboratory for learning. Table 6 reveals that the major barriers preventing students from using computers in our secondary schools are how to integrate it intotheir learning, computers not accessible and no support if something goes wrong. However,distraction of attention by computers, lack of confidence and fear were some of the things, which does not prevent student's respondents from using computers.

**Table 5: The extent to which students are satisfied with the use of computer technologies**

| Computer technologies | Very good | Often | Occasionally | Really | Never |
|---|---|---|---|---|---|
| I am satisfied with the use of YouTube videos to demonstrate Experiments in science | 155<br>51.7% | 15<br>5% | 25<br>8.3% | 15<br>5% | 40<br>13..3% |
| Computers help in expanding my horizon of information related to my courses in science | 60<br>66.7% | 40<br>20% | 25<br>8.3% | 5<br>1.6% | 5<br>1.6% |
| I access and download science learning materials directly from computers. | 20<br>26.7% | 80 | 10 | 10 | 150<br>86% |
| I am satisfied with the way computer technologies increases access to current and important information. | 195<br>65% | 180<br>60% | 125<br>41.7% | 7<br>11.7% | 20<br>6.7% |
| I am satisfied with how computer technologies are being used for students doing class test and presentations. | 32<br>53% | 5 | 10 | 1 | 10 |
| I am satisfied with using of video to demonstrate areas I would not have otherwise understood. | 170<br>56.7% | 40<br>13.3% | 30<br>10% | 20<br>6.7% | 30<br>10% |

Learners should be encouraged to use forums, since they prefer content that is detailed and includes problem-solving and laboratory exercises as well as concept memorization. Intuitive learners should also be encouraged to use forums. It is appropriate for them to also add wikis, YouTube and emails as media because these types of learners prefer content that is innovative and oriented towards theories (Franzoni & Assar, 2009).The results show that most students are not satisfied with the use of computer technologies at their schools. Although, the majority 155 (51.7%) of students are satisfied with how YouTube videos are use to demonstrate experiment in science. YouTube videos assist students in summarizing teaching notes, revising, catching up on missed classes and improving grasping of difficult concepts. Computers are convenient since educational information can even be accessed when the student are away from the school. As a result, students found these podcasts videos very helpful (Litchfield et al, 2007). It was confirmed that, majority of respondents 180 (60.0%) know that Computers help in expanding their horizon of information related to courses in science. It can be seen from the table above that as low as 20 (15%) of respondents responded in the negative when asked whether they download and access informationdirectly from their computers. The personal observation at schools showed that most of the computers in the various schools laboratories were old. It was also observed that some of the computers had also broken down. The researcher was told by the ICT teachers and instructors that the broken down machines have been there for a while because no funds have been allocated to send them for repairs and in some cases buy some parts that have broken down.

Table 8: Student Research question two: Effect of computer technologies on students academic performance

**Table 6, Computer technology makes it easier for me to communicate with my science mates**

| Responses | Frequency | Percentage |
|---|---|---|
| Very often | 135 | |
| Often | 73 | |
| Occasionally | 30 | |
| Really | 15 | |
| Never | 25 | |

It can be seen that 135 (45%) and 6 (24.3%) of the respondents respectively very often agreed and often use computer technologies to communicate with their mate. 30(10%) of them occasionally use computer technologies to communicate with their mates. As low as 15(5%) of the students really use computer to make it easy for them to communicate with their mate. 12(4%) have never use computer technologies to communicate with their friends. A deduction from the above is thatstudents communicate with their mates using computer technologies but not in their various school, this is because computers and not accessible.

**Table 7, The computer technologies help me with my class assignments for my science courses**

| Responses | Frequency | Percentage |
|---|---|---|
| Very often | 20 | |
| Often | 50 | |
| Occasionally | 30 | |
| Really | 20 | 6.7 |
| Never | 160 | 53 |

From table 12, one hundred and sixty (160) representing 53% stated that they have never used computer technology to do assignments. Twenty (20)

respondents representing 6.7%really use computer technology to do assignments. Thirty (30) respondent occasionally use computer to do assignments. Fifty (50) students respondent representing 16.7% often use computer technology to do their assignments. And as low as twenty students respondent representing 6.7% very often use computer technology to do their assignments respondent representing 10% occasional can be seen that 135 (45%) and 6 (24.3%) of really uses computer technology to do assignments. Table 12 reveals that majority of students respondent do not use any form of computer technology to enhance their classroom work and assignments. This attitude of the respondents is in a bad taste in that it will not motivate them to be abreast of modern or new ways of using technology to solve complex problems.

**Table 8, I access and download science learning materials directly from computers**

| Responses | Frequency | Percentage |
|---|---|---|
| Very often | 12 | |
| Often | 18 | |
| Occasionally | 30 | |
| Really | 48 | 6.7 |
| Never | 200 | 53 |

It can be seen that as low as twelve (12) student respondent representing (4%) stated that they very often download and access science learning materials directly from the computer. Eighteen (18) respondents representing (6%) often download and access science learning materials directly from their computer. Thirty student respondent (30) representing 10% occasionally download and access science learning materials directly from computers. Forty-eight students respondent representing 16%. majority of

students respondent two hundred (200) representing 66.7% never download and access science learning materials directly from computer computers to download science learning materials. A the above, it can be concluded that majority of the students never download and access any science learning materials from computers.

**Table 9, Computer technologies has increase my motivation to learn science**

| Responses | Frequency | Percentage |
|---|---|---|
| Very often | 21 | 7 |
| Often | 42 | 14 |
| Occasionally | 30 | |
| Really | 55 | 6.7 |
| Never | 152 | 50.7 |

From table 14, twenty one (21) students respondent representing 7% stated that computer technology very often increase their motivation to learn science. Forty-two (42) respondent representing 14% said that computer technology often increase their motivation to learn science. Thirty (30) students respondents representing 10% stated that computer technology occasionally increase their motivation to learn science. Fifty-five (55) representing 18.3% stated that computer technology has really increased their motivation to learn science. As many as one hundred and fifty-two (152) students representing (52%) stated that computer has very often increase their motivation to learn science.it can be concluded that majority of the students never download and access any science learning materials from computers.

**Table 10, Computers provides enhancement materials to supplement the textbook**

| Responses | Frequency | Percentage |
|---|---|---|
| Very often | 25 | 8.3 |
| Often | 15 | 5 |
| Occasionally | 30 | 10 |
| Really | 70 | 23.3 |
| Never | 150 | 50 |

It can be seen that twenty-five (25) respondent representing (8.3%) and fifteen (15) respondent representing (5%) respectively very often and often agreed that computer provides enhancement materials to supplement the textbooks. Thirty 30(10%) of them agreed that computer technologies occasionally provide enhancement materials to supplement the textbook. Seventy student's (70) respondents representing 23.3% really agreed that computer provide enhancement materials to supplement the textbook. As high as one hundred and fifty (150) students representing (50%) agreed that computers have never provided any enhancement materials to supplement the textbook. The results shows that most students do not use any form of computer technology to supplement their textbook, the only available information to students in these secondary schools are the materials from teachers.

**Table 11, Computer technologies increase my creativity**

| Responses | Frequency | Percentage |
|---|---|---|
| Very often | 20 | 6.7 |
| Often | 15 | 5 |
| Occasionally | 50 | 16.7 |
| Really | 60 | 20 |
| Never | 155 | 51.7 |

From table 16, twenty (20) students respondent representing 6.7% stated that computer technology very often increase their creativity. fifteen (15) respondent representing 5% said that computer technology often increase

their creativity to learn science. fifty (50) students respondents representing 16.7% stated that computer technology occasionally increase their creativity to learn science. sixty(60) representing 20% stated that computer technology has really increased their creativity to learn science. As many as one hundred and fifty-five (155) students representing (51.7%) stated that computers have very often increase their creativity to learn science. A deduction from the above shows that computer technologies have not increase students motivation to learn science.

**Analysis of main teacher data.**

**Do you own a computer?**

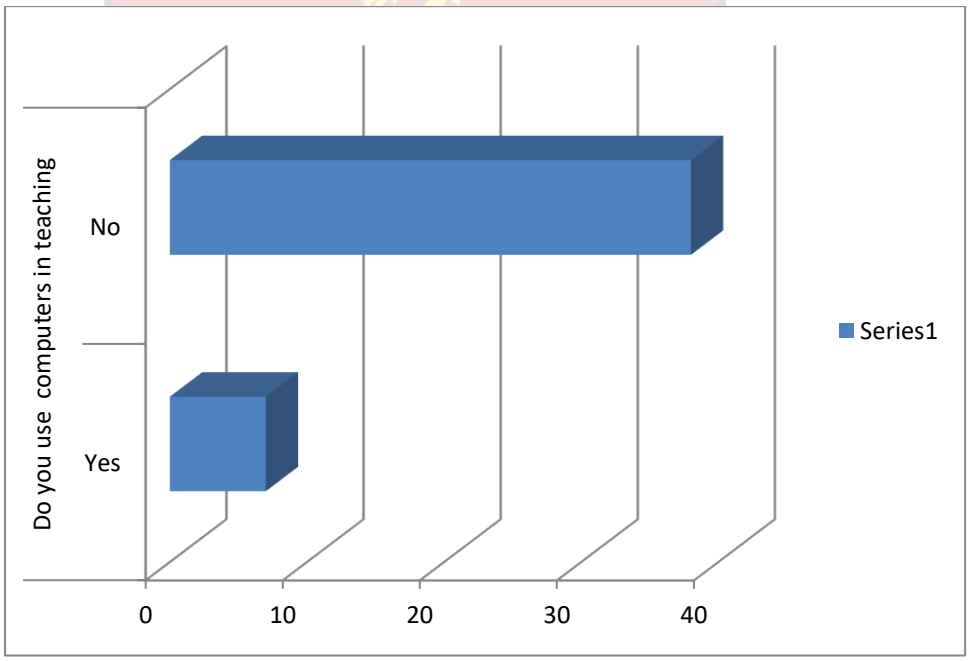


*Figure 6: Analysis of main teacher data.*

Figure 6, shows that as many as thirty five (35) respondent out of the forty-five (45) respondents own laptops. Ten (10) respondents do not own a laptop. It can be deduce that many respondents own laptops in the schools

**Do you use computers in supporting your teaching?**

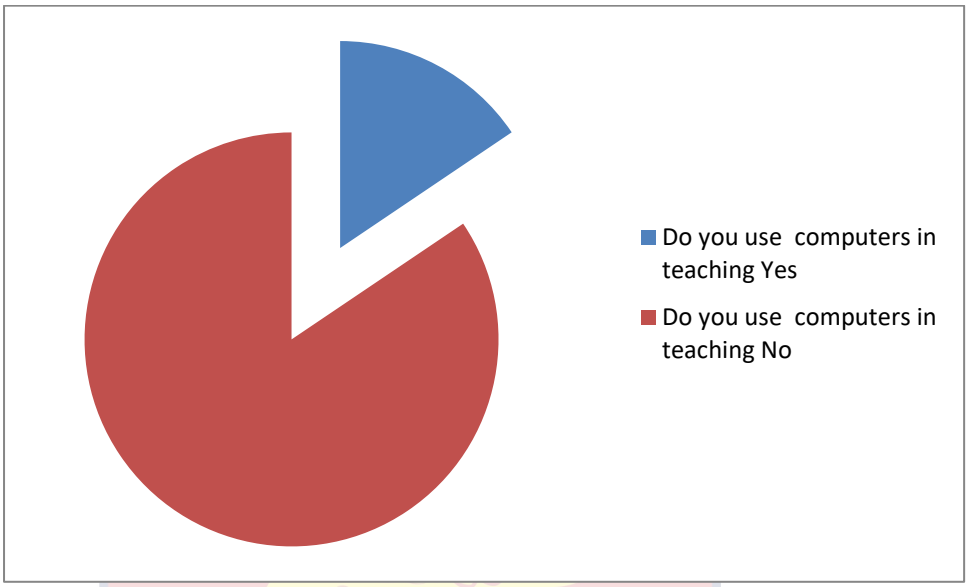


*Figure 7*

It can be seen from figure 7 that as low as thirty-eight (38) respondents responded in the negative when they were asked whether they use computers to support their teaching. The remaining seven (7) respondentsresponded in the affirmative. Once again from the above it can be inferred that majority of the respondents have a negative attitude towards the use of computers in teaching.

**Research question 5: Barriers in using computer technology**

**Table 12: What factors affect your usage of computer in the ICT laboratory**

| Teaching barriers | Agree | Strongly Agree | Disagree | Strongly Disagree | Indecisive |
|---|---|---|---|---|---|
| Lack of time to use computers | 6 (13.3%) | 10 (22.2%) | 9 (20%) | 18 (40%) | 2 (4.4%) |
| I could look stupid if something goes wrong | 7 (15.6%) | 30 (66.7%) | 3 (6.7%) | 5 (11.1%) | 0 0.00%) |
| The equipment available to me at work is unreliable | 4 (8.9%) | 10 (22.2%) | 4 8.9%) | 25 (55.5%) | 2 (4.4%) |
| I do not have enough experience in using computers | 6 (13.3%) | 32 (71.1) | 2 (4.4%) | 5 11.1) | 0 (0.00%) |
| I am too old to learn how to use computers | 3 6.7%) | 5 (11.1%) | 5 (11.1%) | 29 (64.4%) | 3 (6.7%) |
| There is never any help with something goes wrong | 3 (6.7%) | 32 (71.1%) | 3 (6.7%) | 7 (15%) | 0 (0.00%) |
| I know how to use computers but have no idea how to integrate it into my classroom teaching | 3 (6.7%) | 40 (88.9%) | 1 (2.2%) | 1 (2.2%) | 0 (0.00%) |
| Lack of confidence | 5 (11.1%) | 27 (60.0%) | 6 (13.3%) | 5 (11.1%) | 2 (4.4%) |
| Fear | 4 (8.9%) | 33 (73.3%) | 3 (6.7%) | 3 (6.7%) | 2 (4.4%) |
| Computers not available | 5 (11.1%) | 7 (15%) | 29 (64.4%) | 3 (6.7%) | 1 (2.2%) |
| Large classes limit use of computers | 9 (20%) | 7 (15%) | 6 (13%) | 21 (46.7) | 2 (4.4%) |
| Science curriculum is not designed for ICT | 3 (6.7%) | 7 (15%) | 13 (28.9%) | 20 (44.4%) | 2 (4.4%) |
| Internet is not available at school | 7 (15%) | 3 (6.7%) | 15 (33.3%) | 15 (33.3%) | 0 (0.00%) |

From table 14, six (6) respondents representing(13.3%) agreed that lack of time to use computers is what is preventing them from using computers for teaching in the laboratory, whiles ten (10) respondents representing (22.2%) strongly agreed that lack of time is what is preventing them from using computers in teaching, however, nine respondents(20%) disagreed that lack of time is what is preventing them from using computers in the laboratory, eighteen (18) respondents strongly disagreed that lack of time is what is preventing them from using computers in thelaboratory, two (2) respondents were indecisive that time is what is preventing them from using computers in the laboratory.It is clear from table 19 that majority of the teachers did not believe time could prevent them from using computer in the laboratory as 60% disagreed.

Table 14, shows the seven (7) respondent representing (15%) agreed that they could look stupid if something goes wrong while using computers, thirty (30) respondents representing (67.7) agreed that they could look stupid if something goes wrong while using computers, while three (3) respondent representing (6.7%) disagreed that they could look stupid if something goes wrong whiles using in the laboratory, five respondents strongly agreed that they could look stupid with something goes wrong whiles using computers in the laboratory. Table 14 reveals that majority of the respondent strongly agreed that they could look stupid if something goes wrong while trying to integrate computer technologies into their teaching in the laboratory. It can be deduce from table 19 that most of the teachers did not use computers in lab for teaching.

As shown in table 14, the responses of teachers towards the availability and reliability of equipment is better as twenty-five respondents representing (55.5%) and four representing (4.9%) respectively disagreed and strongly disagreed that equipment

available to them are unreliable. However, four (4) respondents representing (8.9%) and ten (10) respondents representing (22.2%) respectively agree and strongly agree that the equipment available to them at the laboratory are unreliable.

From table 14, six (6) respondents representing (13.3%) agreed that they do not have enough experience in using computers, whiles thirty-two respondents responded representing (71.1%) strongly agreed that they do not have enough experience in using computers, on the other hand two (2) respondents representing (4.4%) disagreed that they do not have enough experience in using computers, and five (5) respondent representing (11.1%) strongly disagreed that do not have enough experience in using computers. It can be deduced from table 19 that majority of respondents agreed that they do not have enough experience in using computers as 84.4% agreed.

Table 14 further shows that six (6) respondents representing 6.7%agreed that they are too old to learn how to use computers, five respondents representing 11.1% strongly agreed that they are too old to learn how to use computers, however five (5) respondents disagreed that they are too old to learn how to use computers and twenty-nine (29) respondents representing 64.4% strongly disagreed that they are too old to learn how to use computers. Table 14 reveals that most of the teachers do not agree that they are too old to learn how to use computers.

From table 14, three (3) respondents representing 6.7% agreed that there is never any help with something goes wrong, thirty-two (32) respondents representing 71.1% strongly agreed that there is never any help if something goes wrong, three (3) respondents representing 6.7% disagreed that there is never any help with if something goes wrong, seven respondents representing 15% strongly disagreed that there is never any help with something goes wrong. It can be deduced that majority of

respondents agreed there is never any help with something goes wrong.From table 19, three (3) respondents representing 6.7% agreed that they know how to use computers but do not know how to integrate it into teaching, forty-one (41) respondents representing 88.9% strongly agreed that know how to use computers but do not know how to integrate it into their teaching, however one (1) respondent disagreed and another strongly disagreed with knowing how to use computer but not how to integrate it into teaching. From table 19 it can be seen that most respondent agreed that they know how to use computers but do not know how to integrate it into their teaching.

From table 14, five respondents (5) representing 11.1% agreed that they lack confidence, twenty-seven (27) representing 60% strongly agreed that lack confidence when using computers to teach in the laboratory, six respondents representing 13.3% disagreed that they lack confidence when using computers in teaching, five (5) respondents representing 11.1% strongly disagreed that lack confidence when using computers to teach in the laboratory, two (2) respondent representing 2.2% were indecisive about lack of confidence. From table 19 it can be seen that respondents most of the respondents believe that lack of confidence is a factor preventing respondents from using computers in teaching.

From table 14, four (4) respondents representing 8.9% agreed that fear is preventing them from using computers in the laboratory to teach the children, thirty-three respondents representing 73.3% strongly agreed that fear is a what is preventing them from using computers in teaching,

Three (3) respondents representing 6.7% disagreed that fear prevents them from using computers, again three (3) respondents representing 6.7% strongly disagreed that fear prevents from using computers. From table 19, majority of respondents believe that

fear prevents them from using computers for teaching. A deduction from the above is that it is because of the fear of being disgraced in front of their students that is why some of the teachers feel reluctant in the use of the ICTs.

From table 14, five (5) respondents representing 11.1% agreed that computers are not available at their laboratory, seven (7) respondent representing 15% agreed that computers are not available in their laboratories, seven (7) respondents representing 15% strongly disagreed that computers are not available in their laboratory, twenty –nine respondents disagreed that computers are not available in the laboratory, three (3) respondents representing6.7% strongly disagreed that computers are not available at the laboratory, one respondent representing 2.2% was indecisive to computers being available at the laboratory. From the table it can be deduce that majority of the students believe that computers are available at the various laboratories.

From table 14, five (5) respondents representing 11.1% agreed the large classes limit the use of computer in the laboratory for teaching, seven (7) respondents representing 15.5% strongly agreed that large classes limit the use of computers, six (6) respondents representing 13% strongly disagreed that large classes limit the use of computers in teaching, twenty-six (26) respondents representing 57.8% strongly disagreed that large classes limit the use of computers in the laboratory, one person was indecisive about large classes limiting the use of computers in the laboratory. From table 19, it can be deduced that most respondents did not believe that large class limit the use of computers.

From table 14, three (3) respondents representing 6.7% agreed science curriculum is not designed for ICT, seven (7) respondents representing 15% strongly agreed that science curriculum is not designed for ICT, thirteen (13) respondents

representing 28.9% disagreed that science curriculum is not designed for ICT, twenty (20) respondents representing 44.4% strongly disagreed that science curriculum is not designed for ICT. Table 14 reveals that majority of the respondents did not believe that science curriculum is not designed for ICT since 73.3% disagreed.

As shown in table 19, availability of internet in school is quite better as seven (7) respondent representing 15% agreed that internet is not available in the school, three (3) respondents representing 6.7% strongly agreed that internet is not available in their school, fifteen respondents responding 33.3% disagreed that internet is not available in schools, fifteen respondent strongly disagreed internet is not available at school. A deduction form table 16 shows that most of the respondents believe that internet is not available in their school.

**Table 13: Level of training and skills science teachers have in teaching**

| | **Agree** | **Strongly Agree** | **Disagree** | **Strongly Disagree** | **Indecisive** |
|---|---|---|---|---|---|
| I have been using computers for a very long time | 5 (11.1%) | 4 (8.9%) | 8 (17.8%) | 26 (57.8%) | 2 (4.4%) |
| I do not have enough experience in using computers | 13 (28.9.%) | 25 (55.6%) | 3 (6.7%) | 4 (8.9.%) | 0 0.00%) |
| Have attended training program in ICT | 4 (8.9%) | 5 (11.1%) | 11 24.4%) | 27 (60%) | 2 (4.4%) |
| I have certification in computer training | 3 (6.7%) | 6 (13.3%) | 8 (17.8%) | 28 (62.2.%) | 0 (0.00%) |
| I have skills needed to use computer in my lessons | 2 4.4%) | 0 (0.00%) | 3 (6.7%) | 40 (88.9%) | 0 (0.00%) |
| I have access to software for my teaching | 5 (11.1%) | 2 (4.4%) | 10 (22.2.%) | 28 (62.2%) | 0 (0.00%) |
| Have been trained in the use of computers | 6 (13.3%) | 7 (15.6.%) | 10 (22.2%) | 22 (48.9%) | 0 (0.00%) |

From table 20, a good number of respondents indicated that they have not been using computers for a very long time as the number that disagreed and strongly disagreed are greater than the number that agreed and strongly agreed. It is shown in table 20 that majority of respondents have not been using computers for a very long time as thirty-four (34) respondents representing 75.6% disagreed. Thirty-seven (37) respondents representing 82.2% strongly agreed that they had no enough experience in using computers, majority of respondents again strongly agreed that they have not attended any training program in ICT, thirty-six respondents representing 80% strongly agreed that they have not certification in computer training, majority of respondents forty-three (43) representing 95.6% again strongly disagreed that they have the skills needed to use computer their lessons, most of the respondent responded in the negative as they strongly disagreed that they have access to software for their teaching.

**Table14: Teachers attitude towards the use of computers in teaching.**

| | **Agree** | **Strongly Agree** | **Disagree** | **Strongly Disagree** | **Neither agree nor disagreeee** |
|---|---|---|---|---|---|
| I have no training in the use of computers | 11 (24.4%) | 10 (22.2%) | 2 (2.2%) | 22 (48.9%) | 0 (0.00) |
| I am not sure computers can enhance my teaching | 6 (13.9%) | 6 (13.9%) | 6 (13.9%) | 25 (55.6%) | 2 (2.2%) |
| Computers are not accessible in my school | 4 (8.9%) | 32 (71.1%) | 5 (11.1%) | 4 (8.9%) | 0 (0.00%) |
| The headmaster/headmistress do not care if I use computers or not in my lessons | 9 (20%) | 33 (73.3%) | 2 (2.2%) | 5 (11.1%) | 0 (0.00%) |
| No one to help if something goes wrong | 27 (60%) | 10 (22.2%) | 4 (8.9%) | 4 (8.9%) | 0 (0.00%) |
| Computer equipments are not reliable | 6 (8.9%) | 5 (11.1%) | 26 (57.8) | 8 (17.8%) | |
| I fear using computes to teach | 23 (51.1%) | 5 (11.1%) | 20 (44.4%) | 2 (2.2%) | |

From table 18, most teachers disagreed that they have no training in the use of computers as twenty-four (24) respondents representing 53.3% strongly disagreed that they have no training in computers whiles twenty-one respondents representing 46.7% agreed that they have no training in use of computers. Table 20 Reveals that most of the teachers were sure that computers can enhance their teaching as twenty-seven (27) respondents representing 68.9% strongly disagreed that computers cannot enhance their teaching and twelve (12) respondents representing 26.7% agreed that computers cannot enhance their teaching. Table 20 again reveals that majority of the respondents strongly agreed that computers are not accessible in their schools as thirty-six (36) respondents representing 80% agreed that computers are not accessible in their school while only nine (9) respondents representing 20% disagreed that computers are not accessible in their school. From table 20, most respondents strongly agreed that their headmaster/headmistress do not care if they use computers or not in their lesson as forty-two (420) respondents representing 93.3% strongly agreed while only three (3) respondents representing 6.7% disagreed that their headmaster/headmistress do not care if they use computers or not my lessons. From table 20, majority of respondents agreed that there is no help if something goes wrong as thirty-seven (37) respondents agreed while eight (8) representing 17.8% disagreed that there is not help if something goes wrong. From table 20 most of the respondents disagreed that computer equipments are not reliable while eleven respondents (11) representing 24.4% believe that computer e equipment are reliable.

**Table 15: Perception teachers have in the use of computers**

| | Agree | Strongly Agree | Disagree | Strongly Disagree | Neither agree nor |
|---|---|---|---|---|---|
| I need training in using computers | 6 | 30 | 4 | 5 | 0 |
| | (13.3%) | (66.7%) | (2.2%) | (11.1%) | (0.00) |
| Young men are suppose to use computers and not old men | 12 | 18 | 7 | 6 | 2 |
| | (13.9%) | (13.9%) | (13.9%) | (55.6%) | (2.2%) |
| I don't have time to integrate computers in my teaching | 4 | 30 | 7 | 4 | 0 |
| | (8.9%) | (71.1%) | (11.1%) | (8.9%) | (0.00%) |
| Have an idea in computers but do not know how to add it to my teaching because my period is short | 9 | 33 | 2 | 5 | 0 |
| | (20%) | (73.3%) | (2.2%) | (11.1%) | (0.00%) |

From table21, majority of the respondents strongly agreed that they need training in using computers as thirty-six (36) respondents representing 80% strongly that they need training on how to use computers whiles nine respondents (9) representing 20% agreed that they do not need training on how to use computers. Table 21 reveals that most of the respondents agreed that young men are supposed to use computers and not old men as thirty (30) respondents representing 66.7% agreed that young men are supposed to use computers and not old men while thirteen (13) respondents representing 28.9% disagreed that young men are supposed to use computers and not old men. Table 21 reveals that most respondents do not have time to integrate computers in their teaching as thirty-four (34) respondents representing 75.6% agreed that they don't have time to integrate computers in their teaching while eleven respondents (11) representing 24.4% disagreed that they do not have time to

integrate computers in their teaching. From table 21 majority of the respondents strongly agreed that they have knowledge in computers but do not know how to integrate it into their teaching because their periods are short whiles seven respondents (7) representing 15.6% disagreed that their periods are short that is why they do not integrate computers in their teaching.

**Table 16: Effect of computer technologies on students academic performance**

| STUDENTS PERFORMANCE | Agree | Strongly Agree | Disagree | Strongly Disagree | Neither agree nor |
|---|---|---|---|---|---|
| Computer technologies can make it easier for me to communicate with my science students | 6 (13.3%) | 31 (66.7%) | 4 (2.2%) | 4 (11.1%) | 0 (0.00) |
| Computer technologies can help me with my class assignments for my science lessons | 9 (13.9%) | 26 (13.9%) | 5 (13.9%) | 4 (55.6%) | 1 (2.2%) |
| I access and download science learning materials directly from computers | 8 (15.6%) | 6 (13.3%) | 15 (33.3%) | 16 (35.6%) | 0 (0.00%) |
| Computer technologies can increase my motivation to teach science | 7 (15.6%) | 29 (64.4%) | 5 (11.1%) | 4 (8.9%) | 0 (0.00%) |
| Computer technologies can increase my creativity | 17 | 10 | 8 | 10 | 0 |

When teachers are well trained to integrate technologies efficiently into their lessons strategies then students are likely to be more satisfied with their education (Wurst et al, 2008). From table 22, six respondents representing 13.3 % agreed that computer technologies can make it easier for them to communicate with their science students. Thirty-one respondents (31) strongly agreed that computer technologies can make it easier for them to communicate with their science students, five respondents

(5) disagreed that computer technologies can make it easier for them to communicate with their science students, four respondents strongly disagreed that computer technologies can make their lesson easier. Table 22 reveals that majority of respondents strongly believe that computer technologies can make it easier for them to communicate with their science students.

From table 22, nine respondents (9) representing 20% agreed that computer technologies can help them with their class assignments for their science lessons. Twenty-six (26) respondents representing 57.8% strongly agreed that computer technologies can help them with their class assignments for their science lessons, five (5) respondents representing 11.1% disagreed that computer technologies can help them with their class assignment for their science lessons, four respondents (4) strongly disagreed that computer technologies can help them with their class assignment for their science lessons, however one (1) respondent representing 2.2% neither agreed nor disagreed that computer technologies can help them with their class assignment for their science lessons. Table 22 reveals that most of the respondents believe that computer technologies can help them with their class assignment for their science lessons.

From table 22, eight (8) respondents representing 15.6% agreed that they access and download science learning materials directly from computers, six respondents (6) representing 13.3% strongly agreed that they access and download science learning materials directly from computers, fifteen respondents (15) representing 33.3% agreed that they access and download science learning materials directly form computers, sixteen (16) respondents representing 35.6% strongly disagreed that they access and download science learning materials directly from

computer. From table 22, majority of the respondents disagreed that they access and download science learning materials from their computer.

From table 22 seven (7) respondents representing 15.6% agreed that computer technologies can increase their motivation to teach science, twenty-nine (29) respondents representing 64.4% strongly agreed that computer technologies can increase their motivation to teach science, five (5) respondents representing 11.1% disagreed that computer technology can increase their motivation to teach science, four (4) respondents representing 08.9% disagreed that computer technologies can increase their motivation to teach science. The table reveals that most teachers believe that computer technologies can increase their motivation to teach science

# CHAPTER FIVE

# SUMARY, CONCLUSIONS AND RECOMMENDATIONS

## Overview of the study

This chapter presents the summary, conclusions, recommendations and suggestion for the studies

## Summary

The main issues on which the study focused were the effect of computer technologies on the academic performance of science students and teachers with a particular reference to Sekondi Takoradi Metropolitan Assemble (STMA). A descriptive survey was used to collect data and to describe conditions in the schools. The sample of the study included forty-five teachers (45) and three hundred students (300), the participating schools were Sekondi College, Ghana Secondary Technical School, Fijai SHS, and Archbishop Potter Girls' SHS.

Data was collected through the use of questionnaire to elicit responses from the selected respondents. The entire questionnaire were administered.

However, out of the three hundred (300) students sampled for the study, one student could not submit his/her questionnaire, therefore two hundred and ninety-nine questionnaires were successfully retrieved representing 99% return rate from the students. For the case of the teachers, the entire forty-five questionnaires were retrieved representing 100% return rate from the teachers.

The data was analyzed using simple frequencies presented by tables.

The findings obtained in this study revealed that computer technologies have serious effects on the academic performance of students.

**Key Findings**

The findings that emerged from the study are grouped under the following headings:Bio data of respondents (teachers and students) and the broad research questions and hypothesis.

**Findings from the analysis of the Bio Data of respondents.**

From the analysis of the Bio-data, it was revealed that more male teachers toke part than female teachers, which could be as a result of the fear that most female teachers have about science as a subject. Majority of the teachers have spent more than five (4) years in teaching. It was also revealed that majority of the teachers the study covered were first-degree holders. Most of the students were females, which also reveal the high number of females we have in our secondary level. One hundred and sixty respondents representing were 17years, the sharp rise in ages in the SHS is due to the resit and the free SHS that has been introduced.

**Barriers preventing the integration of ICT in education in the Senior High Schools in the Sekondi - Takoradi Metropolis.**

It was revealed that the major barriers preventing students from using computers in our secondary schools are how to integrate it into their learning, computers not being accessible and no support if something goes wrong. It was also revealed that majority of the students do not know anything about how to download information to support their classroom work.

Majority of the teachers had the perception that their students will laugh at them if they make a mistake, as a result of this they are not willing to use the computers.

The study also revealed that there were so many broken down computers in all the schools visited and that the lack of funds were preventing them from being repaired.

**Student's satisfaction with the use of computer technologies.**

It was confirmed that, majority of students about one hundred and eighty (180) know that Computers can help in expanding their horizon of information related to courses in science.

**Impact of Computer technologies on students' academic performance**

It was revealed that as low as twenty very often use computer technology to do their assignments.

It was revealed that computer technologies have not increase student's motivation to learn science in the various school and this is as a result of students not knowing how to integrate it into their learning. Majority of the students never download and access any science learning materials from computers. Also, computers do not provide any enhancement materials to supplement the textbook. The results show that most students do not use any form of computer technology to supplement their textbook, the only available information to students in these secondary schools are the materials from teachers. respondents responded in the affirmative. Once again from the above it can be inferred that majority of the respondents have a negative attitude towards the use of computers in teaching. Majority of the respondents have a negative attitude towards the use of computers in teaching.

**Attitudes of the teachers in the use of computers**

Majority of the teachers who claimed they have not used computers before were not prepared to even learn how to use it. Secondly it came out that although there are computers in the various schools, the teachers do not know how to use them, and even almost all of them do not use them for their practice and teaching.

**The perceptions of teachers with regards to the use of ICT in teaching and learn**

The study revealed that majority of the respondents had little knowledge in computers

and do not know how to integrate ICT into their teaching because their periods are too short.

**Conclusions**

The following are the conclusions that were drawn based on the objectives that were set/

Factors preventing students from using computers in laboratory to learn. It was discovered that the students would like to use the computers to learn. What was observed was the lack of knowledge on how to integrate computer technology on the part of the teachers into teaching and learning.

It can be concluded that most of the teachers and students do not have positive attitudes towards the use of computers. This conclusion was arrived at because despite the fact that respondents had computers at their disposal they are not prepared to use and do not have the intention of even using it. It can be inferred that even if there were to be internet facilities which will provide a wide database of information, teachers will still not use it.

On the effect of computer technologies on students' academic, it can be concluded that most of the schools, older teachers are of the view that the use of computers is something for the younger generations. With this, they contended that the use of computers in education should be designed and taught on its own as it is currently being done so that they can still have a job to do and not force all teachers to undertake a course in the use of computers in education. Almost all the schools have laboratories, which is only used for teaching ICT lessons.

In conclusion, performance is on the assessment of the extent of availability of computers in the various schools, it can be concluded that most of the schools do not

have enough computers to be used by the students and most of the computers in the laboratories are not functional.

**Recommendations**

1.The researcher recommends that the various Ghana Education Service should encouraged teachers to integrate computer technologies in their teaching, in that way students will learn how to use technology in their learning.

2. Teachers should be given special training on the use of computers in their lesson delivery to enable students to understand concept.

3. ICT infrastructures should be supplied to the Senior High Schools (SHS) for effective teaching and learning process since it is the basic stage of equipping the youth with the necessary skills and knowledge they need for national development.

**Suggestions for future research**

1. Even though the researcher has done much work, there is still more room to be filled. The researcher suggests that whoever wishes to undertake a similar study should concentrate on a larger sample in many different senior high school and in a different topic to get a better representation of the entire population to find out if similar results could be obtained.

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# APPENDICES

## APPENDIX A

## QUESTIONAIRE FOR TEACHERS

I am conducting a research on the use of computer technology and how it can enhance academic performance of science students in second cycle schools. You have been selected to participate responding to this questionnaire. Your honesty and co-operation will go a long way in helping to accomplish the goal of this study. You are requested to give personal opinions and answers. Please respond to the questionnaire as appropriate by ticking or provide information where necessary. Any information provided would be treated as confidential.

**INSTRUCTIONS:** Please tick where applicable and provide answers where appropriate.

**PART: ONE DEMOGRAPHIC**

1. Name of second cycle school _____

2. Gender a) Male ( ) b) Female ( )

3. How long have you been teaching at the present school?

a) 1-4 yrs. ( ) b) 10-14 yrs. ( ) c) 5-9 yrs. ( ) d) Above 15 yrs. ( )

4. What is the highest level of qualification that you have?

a) First degree ( ) b) Masters ( ) c) PhD ( )

5. Do you own a computer? Yes ( ) No ( )

6. Do you use computers in supporting your teaching? Yes ( ) No ( )

7.i) If Yes, in what way are you using it?

_____

_____

_____

ii) If No, what is the reason for not using computers in supporting teaching?

_____

_____

_____

**SECTION A: BARRIES IN USING COMPUTER TECHNOLOGIES**

What factors affect your usage of computers in the ICT laboratory? (Tick all that apply)

| Teacher barriers | Agree | Strongly Agree | Disagree | Strongly Disagree | Indecisive |
|---|---|---|---|---|---|
| a) Lack of time to use computers | | | | | |
| b) I could look stupid if something goes wrong | | | | | |
| c) Computers are a thing for young people | | | | | |
| d) The equipment available to me at work is unreliable | | | | | |
| e) I do not have enough experience in using computers | | | | | |
| f) I am too old to learn how to use a computer | | | | | |
| g) There is never any help if something goes wrong | | | | | |
| h) I know how to use a computer but have no idea how to integrate it into my classroom teaching | | | | | |
| i)Lack of confidence | | | | | |
| j) Fear | | | | | |
| k) Computers not available | | | | | |
| l) Large classes limit use of computers | | | | | |
| m)Science curriculum is not designed for ICT | | | | | |
| n) Internet is not available at school | | | | | |

**SECTION B: LEVEL OF TRAINNING AND SKILLS SCIENCE TEACHERS HAVE IN TEACHING**

| | Agree | Strongly Agree | Disagree | Strongly Disagree | Indecisive |
|---|---|---|---|---|---|
| I have been using computers for a very long time. | | | | | |
| I do not have enough experience in using computers | | | | | |
| Have attended training program in ICT. | | | | | |
| I have the skills needed to use computers in my lessons | | | | | |
| I have access to software's for my teaching | | | | | |
| Have been trained in the use of computers | | | | | |
| Have certification in computer training. | | | | | |

**SECTION C: TEACHERS ATTITUDES TOWARDS THE USE OF COMPUTER IN TEACHING**

| | Agree | Strongly agree | Disagree | Strongly Disagree | agree nor |
|---|---|---|---|---|---|
| I have no training in the use of computers | | | | | |
| I lack confidence when I use computers in teaching | | | | | |
| I am not sure computers can enhance my teaching | | | | | |
| Computers are not accessible in my school. | | | | | |
| The headmaster/mistress do not care if I use computers or not in my lessons | | | | | |
| No one to help if something goes wrong | | | | | |
| 6. Computers equipment's are not reliable | | | | | |
| I fear using computers to teach | | | | | |

**PERCEPTION TEACHERS HAVE IN THE USE OF COMPUTERS**

| | Agree | Strongly agree | Disagree | Strongly Disagree | agree nor |
|---|---|---|---|---|---|
| I need training in using computers. | | | | | |
| Young men are suppose to use computers and not old men. | | | | | |
| I don't have time integrate computers in my teaching. | | | | | |
| Have an idea in computers but do not know how to add it to my teaching because my period is short | | | | | |

**EFFECT OF COMPUTER TECHNOLOGIES ON STUDENTS ACADEMIC PERFORMANCE**

| STUDENTS PERFORMANCE | Very good | Often | Occasio nally | Really | Never |
|---|---|---|---|---|---|
| 1.Computer technologies make it easier to me to communicate with my science students | | | | | |
| 2. The computer technologies help me with my class assignments for my science | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| courses | | | | | |
| 3.I access and download science learning materials directly from computers | | | | | |
| 4. Computer technologies has increased my motivation to learn science. | | | | | |
| 5.Computers provides enhancement materials to supplement the textbook. | | | | | |
| 6 Computer technologies increase my creativity. | | | | | |

## APPENDIX B

## STUDENTS QUESIONNAIRE

I am conducting a research on the use of computer technologies and how it can enhance academic performance of science students in second cycle schools. You have been selected to participate by responding to this questionnaire. Please respond to the questionnaire as appropriate by ticking or provide information where necessary. Any information provided would be treated as confidential.

**INSTRUCTIONS:** Please tick where applicable and provide answers where appropriate.

**DEMOGRAPHIC INFORMATION**

1. Name of school _____

2. Gender a) Male ( ) b) Female ( )

3. Age in years

a) Below 13 ( ) b) 14-16 ( ) c) 17 ( ) d) 18 and above ( )

4. Which of the following subject do you love most?

a) Physics ( ) b) Chemistry ( ) c) Mathematics ( ) d ( ) Biology ( )

6. Do you own a computer in the house? Yes ( ) No ( )

Do you have access to computers in the school?

Yes [ ] No [ ]

7.) Do you have Internet access on your school? Yes ( ) No ( )

How do you think computers can impact your learning in science at your school?

a) Negatively b) No change c) No idea d) Positively

How would you rate your experience with computers ( Tick all that apply)

a) Have never used a computer and do not intend to ( )

b) I have never used a computer but would like to learn ( )

c) I use applications such as word processing, spreadsheets, the internet etc (

18. How many hours per week is it permissible for you or get the chance to use the

computers in the school?

Less than an hour [ ] 1 – 3 hours [ ] 4 – 6 hours [ ] 7 – 9 hrs [ ] Above 10 hrs [ ]

**SECTION A: BARRIES IN USING COMPUTER TECHNOLOGIES**

1 Which factors affect your usage of computers in the ICT laboratory? (Tick all that

apply)

a) Lack of time to use computers [ ]

b) Lack of knowledge about computers [ ]

c) Lack of confidence [ ]

d) Fear [ ]

e) Little previous experience [ ]

f) Computers not accessible [ ]

g) Computers not available [ ]

h) No support if something goes wrong when using computers [ ]

I) d) I know how to use a computer but have no idea how to integrate it into my learning [ ]

J) Computers will distract my attention in the classroom [ ]

**SECTION B. THE EXTENTS TO WHICH STUDENTS ARE SATISFIED WITH THE USE OF COMPUTER TECHNOLOGIES**

| Computer technologies | **Very good** | **Often** | **Occasionally** | **Really** | **Never** |
|---|---|---|---|---|---|
| 1. I am satisfied with the use of YouTube videos to demonstrate Experiments in science. | | | | | |
| 2. computers help in expanding my horizon of information related to my courses in science | | | | | |
| 3.I access and download science learning materials directly from computers | | | | | |
| 4. I am satisfied with the way computer technologies increases access to current and important information. | | | | | |
| 5. I am satisfied with how computer technologies are being used for students doing class test and presentations. | | | | | |
| 6. I am satisfied with using of video to demonstrate areas I would not have otherwise understood. | | | | | |

**SECTION C: EFFECT OF COMPUTER TECHNOLOGIES ON STUDENTS ACADEMIC PERFORMANCE**

| STUDENTS PERFORMANCE | Very good | Often | Occasionally | Really | Never |
|---|---|---|---|---|---|
| 1. Computer technologies make it easier for me to communicate with my science mates | | | | | |
| 2. The computer technologies help me with my class assignments for my science courses | | | | | |
| 3.I access and download science learning materials directly from computers | | | | | |
| 4. Computer technologies has increased my motivation to learn science. | | | | | |
| 5. Computers provides enhancement materials to supplement the textbook. | | | | | |
| 6. Computer technologies increase my creativity. | | | | | |