An Investigation into the use of ICT Tools in the Technical Vocational Education and Training (TVET) Delivery – Evidence from Kumasi Metropolis

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ABSTRACT
This dissertation investigated the use of ICT tools in Vocational and Technical Education and Training (TVET) in the Kumasi Metropolis. The study was designed to collect information from selected schools on how far they use ICT tools in teaching technical subjects. The people who were contacted with the research were ICT teachers, technical teachers on the field, parents and educationists, students and computer experts. The research objective was to find out if adequate or well-equipped structures have been put in place for this modern technology and also to find out if enough funds are provided for maintenance to promote effective teaching and learning. The descriptive research design was adopted and questionnaires and interviews were used as the research instruments. The Statistical Package for Social Sciences (SPSS) was used to analyse the results. The sample involved 400 students, 100 teachers, 80 ICT teachers and 40 parents and educationist. Four Deputy/Assistant Directors and two computer experts were also interviewed. The results showed that about 86% of respondents would like the usage of ICT tools in our Voc/Tech schools for the students to be abreast with current technological advancement. The schools do appreciate the contribution of ICT tools to their performance, but there are various barriers which require government intervention to adopt appropriate policies to address them. The findings, however, revealed financial problems, unavailability of quality ICT teachers, lack of ICT tools and lack of well-equipped computer laboratories, making it difficult to continue with the programme which has already started in the schools visited. In any case, there is still the need for improvement as outlined in the recommendations. The recommendations serve as a guideline for planning; the need to apply ICT tools in Voc/Tech schools and implementing computer education in Voc/tech Schools in Ghana especially in the Kumasi Metropolis.

Keywords
TVET, ICT

1. INTRODUCTION
The Basel missionaries, the pioneers in the educational enterprise in Ghana made tremendous contribution in the field of agriculture and technical education. They placed emphasis on inculcating industrial skills in the educational system with support from their counterparts in Switzerland.

The Basel Missionaries promoted technical training in line with their global plans to train people in technology as reported in Basel Convention [1].They taught some skills such as handicraft in their school and gave their converts the actual process of building their houses, elementary lessons in carpentry, joinery and masonry. Some workshops were set-up in all their covens. To put this scheme on proper basis, regular trade schools with workshops under qualified lay missionaries were introduced in the 1850s. Also, an industrial school was opened in Christiansburg (now Accra) in 1857 where courses in joinery, carpentry, shoe making, bookbinding and ironwork were taught. In 1860, trade schools were opened at Abokobi, Aburi and Akropong and a shop was opened at Christiansburg (Accra) the headquarters of the trade school [1]. The trend continued until many schools were built across the country. Since then, technical and vocational education has under gone a lot of changes.

The 1987 educational reforms of Ghana brought changes in the curriculum of the educational system. Many subjects were introduced and among them was a computer studies [2]. Computer study was also introduced into the educational system by some private institutions.

It is an expensive venture to run as part of the school curriculum. However, schools that have adapted it have really taken giant steps into the world of computer literacy. It is no doubt that such schools have taken a lead in the technological world of education because the computer has come to stay. In recent times it is difficult for one to find a job in the global world without knowledge in computing.

The Computer in recent times has become part and parcel of every life, and their applications have permeated every sphere of man's endeavour. In the world of business, computers have taken over almost all manual operations; it is used in payroll preparation, bookkeeping, accounting, inventory control, auditing, and point of sales services and many more other operations are now performed with computers. Computers are also used extensively in such areas as Science, Healthcare, Transport, Communication, Engineering and many more. There is a global development in technology; therefore, Ghana cannot afford to be left out.

A survey conducted in some technical institutions indicated that only few students could actually use the computer very well. This is because they were not introduced to the computer before they entered the Technical/Vocational (Tech/Voc) arena. At the university level, there are some people who have little or no knowledge in computing and this phenomenon has contributed immensely to graduate

unemployment [3].

Due to the present policy by Government to promote private sector participation in the economy, many entrepreneurs have resorted to the use of high technology, which involves the use of computers, which are very effective. Now most of our electrical/electronics gadgets were made with integrated circuits (IC) and Computer Aided Design (CAD). It is, therefore, imperative for technical students and for that matter the electronics student to be computer literate, hence the need to expose the students to computers at technical institutions.

Schools that have been able to introduce computing have been exposed to a type of technology which has placed them miles ahead of their colleagues in other technical institutions. Information from some of the schools suggests that, most of the Technical/ Vocational Teachers have little or no knowledge in computing. Efforts are being made by some of the schools that have introduced Information Technology (IT) as part of their curriculum to train more teachers to handle the subject. In some schools, targets have been set over a period of time within which they hope to achieve their set goals in IT.

The use of IT therefore has been limited to the affiliate people in our technical/vocational institutions who are unfortunately few. Hence IT should be looked at seriously to embrace everybody in the technical/vocational field.

There is a fresh awareness among policy makers in many African countries and the international donor community of the critical role that Technical and Vocational Education and Training (TVET) can play in national development. The increasing importance that African governments now attach to TVET is reflected in the various Poverty Reduction Strategy Papers that governments have developed in collaboration with the World Bank. One of the most important features of TVET is its orientation towards the world of work and the emphasis of the curriculum on the acquisition of employable skills. TVET delivery systems are therefore well placed to train the skilled and entrepreneurial workforce that Africa needs to create wealth and emerge out of poverty. Another important characteristic of TVET is that it can be delivered at different levels of sophistication. This means that TVET institutions can respond to the different training needs of learners from different socio-economic and academic backgrounds, and prepare them for gainful employment and sustainable livelihoods. The youth, the poor and the vulnerable in society can therefore benefit from TVET.

The African Union (AU) has a vision of "an integrated, peaceful, prosperous Africa, driven by its own people to take its rightful place in the global community and the knowledge economy." This vision is predicated on the development of the continent's human resources. In its Plan of Action for the Second Decade of Education (2006 – 2015), the AU recognizes the importance of TVET as a means of empowering individuals to take control of their lives and recommends therefore the integration of vocational training into the general education system. The AU also recognizes the fact that vast numbers of young people are outside the formal school system, and consequently recommends the integration of non-formal learning methodologies and literacy programmes into national TVET programmes [4].

1.1 Statement of the Problem

To achieve better and sound development, the educational system should be flexible to make it responsive to gradual changes in the educational system and technological dispensation in the world of work. It is in this light that this study attempts to access the extent of use of IT (computers) in the teaching of technical subjects in Vocational/Technical (TVET) Schools. The Computer is one of the most important machines today which is used in almost every facet of human life to collect data, process and produce information. It will, therefore, be a big mistake if computer studies are not introduced in our technical/vocation Institutions. This is because graduates from such schools will be the future middle level manpower personnel of our industries.

Society today is dynamic and therefore the dynamism of the society must affect the educational system. Hence, in order to meet the changes needed to transform society, it is very necessary to meet the required technological standards as it pertains in the developed world.

It is worthy to note that computer education is gradually creeping into the educational system which is making things easier for all stakeholders in education to communicate effectively especially in the teaching and learning process. The introduction and use of computers in our Vocational and Technical Institutions will allow information to be handled more quickly and reliably. Nowadays, the most reliable information one can get all over the world on the computer is through the internet, [5] which most advanced countries like Britain, American, Germany, Japan etc depend on.

Computer can now be seen at almost every public place such as offices, shops, banks, schools and even in recent time's hospitals and laboratories. The computer is now being used in our homes and children are becoming more and more familiar with its use. Most electrical/electronic gadgets have their circuit boards and operating manual on the internet, sometimes, how to assemble and build circuit's boards are all available via the internet.

Some institutions have introduced computers in their schools but only a few members of staff actually get access to them. In some cases the students do not get access to the computers at all, because some schools do not have the computers or the teachers who should teach them are themselves computer illiterate. However, some schools have been able to get benevolent organizations like NGOs, PTA, Old Boys and Girls Associations to provide them with sufficient numbers of computers and students are able to use them.

In this regard, the writer of this thesis examines and to come out with some reasons why computers should be used in Technical/Vocational Institutions, especially in electrical and electronic departments. And also come out with suggestions which the government can use to formulate policies that will aid computer studies at all levels of education with special emphasis on Technical/ Vocational Institutions.

1.2 Objectives of the study

The world is fast developing with sophisticated technologies and this has caught up with all aspects of human lives including education. The researchers chose this topic to reflect on the paramount role computers play in tech/voc education. Computers have a major role to play in our educational system and though it is relatively new in the system, it has proved to be an effective and indispensable technology in modern education. The specific objectives of the study were:

1.2.1 To assess the importance of using ICT tools in technical and vocational schools

1.2.2 To determine how students can be guided in the use of computers.

1.2.3 To determine how to manage and maintain computers, to make them more effective, when using them in Vocational/Technical Institutions.

1.2.4 To determine how awareness can be created for the government, the mass media, parents, educationist and all stakeholders in education to implement policies that will make everybody embrace the use of computers.

1.2.5 To ascertain some of the simple programmes that can be introduced at the technical and vocational level?

1.2.6 To determine the source of funding of ICT education in technical and vocational schools.

1.3 Research Questions

1.3.1 In order to determine the importance of the introduction of computer studies at the Technical and Vocational School Level, the following questions were found to be very useful.Is computer study very necessary in Technical and Vocational Institutions?

1.3.2 How can students be guided in the use of computers?

1.3.3 How the computers should be managed to make them more effective when using them in Vocational/Technical Institutions?

1.3.4 How can awareness be created for the government, the mass media, parents, educationist and all stakeholders in education would embrace the use of computers?

1.3.5 What are some of the simple programmes that can be introduced at the technical and vocational level?

1.3.6 How should ICT education in vocational and technical Schools be funded?

1.4 Significance of the Study

1.4.1 This write-up highlights the importance of the introduction of computing in technical and vocational schools and the extent to which these institutions have gone. Due to constant and rapid changes going on all over the world in terms of electrical and electronic gadgets, Cars, Industrial Machines and so on, there is the need to be abreast with these technological changes. If the children of today know how to manipulate the computer at the technical level, by the time they reach the tertiary level, they may design and program computer applications.

1.4.2 It is very sad today that a sizable number of the students who come out from the universities do not know how to operate the computer. If this is introduced at the technical and vocational level, it will broaden the minds of the students which will raise their social status in future. It will also make the teaching and learning of Technical subjects very easy because everything will be programmed on the computer for the use by students and teachers.

1.4.3 This research, apart from assessing the extent of use of computing in technical and vocational institutions, also finds out the progress certain schools have made after computers were introduced as part of their curriculum.

1.4.4 The research also looks at how some schools in the advanced countries use computers at the same level as technical and vocational levels in Ghana.

1.4.5 The research also looks at the internet and how it can be beneficial to technical and vocational schools.

1.5 Organization of the Study

The study is organised into six chapters. Chapter One dealt with the introduction, Chapter Two reviewed literature on the topic, Chapter Three discussed the methodology and the organization profile; the penultimate Chapters (Four and Five) dealt with data presentation, analysis and discussion; and Chapter Six addressed the findings, conclusions and recommendations.

2. LITERATURE REVIEW

2.1 Introduction

The rapid diffusion of computers and internet use has been a fixture of the global landscape over the last decade; nonetheless, rates of technology use still differ markedly across countries. Estimates from the International Telecommunication Union (ITU) indicated that only three percent of the population in all developing countries used the internet in 2004. In contrast, more than 50% of all developed countries used the internet with the rate of technology use being substantially higher in many European and North American countries. These disparities in technology diffusion may have important economic consequences because technology use may increase knowledge diffusion through improving communication efficiency [6], improve political engagement [7], increase productivity [8,9], and allow developing countries to access traditional methods of increasing productivity [10]. The importance of ICT diffusion in developing countries to economic advancement has been stressed in the policy arena and previous literature [11].

2.2 The importance of ICT Tools in Tech/Voc Schools

Computer-Aided Instruction (CAI), diverse and rapidly expanding spectrum of computer technologies that assist in the teaching and learning process. CAI is also known as computer-assisted instruction. Examples of CAI applications include guided drill and practice exercises, computer visualization of complex objects, and computer-facilitated communication between students and teachers. The number of computers in American schools rose from one for every 125 students in 1981 to one for every nine students in 1996. While the United States leads the world in the number of computers per school and student, Western European and Japanese schools are also highly computerized [12].

Information that helps teach or encourages interaction can be presented on computers in the form of text or in multimedia formats, which include photographs, videos, animation, speech, and music. The guided drill is a computer program that poses questions to students, returns feedback, and selects additional questions based on the students' responses. Recent guided drill systems incorporate the principles of education in addition to subject matter knowledge into the computer program.

Computers can also help students visualize objects that are difficult or impossible to view. For example, computers can be used to display human anatomy, molecular structures, or complex geometrical objects. Exploration and manipulation of simulated environments than can be accomplished with CAI—ranging from virtual laboratory experiments that may be too difficult, expensive, or dangerous to perform in a school environment to complex virtual worlds like those used in airplane flight simulators.

CAI tools, such as word processors, spreadsheets, and

databases, collect, organise, analyse, and transmit information. They also facilitate communication among students, between students and instructors, and beyond the classroom to distant students, instructors, and experts.

CAI systems can be categorised based on who controls the progression of the lesson. Early systems were linear presentations of information and guided drill, and control was directed by the author of the software. In modern systems, and especially with visualization systems and simulated environments, control often rests with the student or with the instructor. This permits information to be reviewed or examined out of sequence. Related material also may be explored. In some group instructional activities, the lesson can progress according to the dynamics of the group.

Computer technology has not been officially introduced as part of the curriculum of school but some schools in Ghana, especially the private schools are using it, though it is a new technology being used in the schools, it is spreading fast because parents, teachers, students and the communities have come to understand computer technology and its importance.

2.3 Importance of Computer Education

In today's technological world, computer education is very vital in order to turn-out students who are computer literate and who can find their levels in the job market after school. In the field of communication, E-mail has replaced many millions of letters, written on paper, collected, sorted and delivered worldwide, with almost instantaneous communication that has a very small environmental footprint (Schmidt and Kloverpris, 2009). ICTs offer the potential for transport and travelled substitution. With tele-work or e-work the reduction of transport and commuting time can be substantial and considerable savings can accrue for individuals, employers and community. ICTs can contribute to the resource and energy efficiency of many physical products embedded in either the products themselves or their production processes, (Plepys, 2002). In recent years, many well meaning companies are computerizing their operations and systems hence a graduate who is computer illiterate may not fit into the changing job market. This makes computer education indispensable in the modern education curricula.

2.4 The use of Computers in some Schools in developed Countries.

Computer technology, started many years ago and it has been one of the most important technologies ever made by man, many countries virtually depends on the computer for every aspect of their lives. Computer is used in industries, banks, hospitals, schools, communication and many more you can think of. Notable among the usage of computer is in schools (Ghosh, 2009). People use computers in many ways. In business, computers track inventories with bar codes and scanners, check the credit status of customers, and transfer funds electronically. In homes, tiny computers embedded in the electronic circuitry of most appliances control the indoor temperature, operate home security systems, tell the time, and turn video cassette recorders (VCRs) on and off. Computers in automobiles regulate the flow of fuel, thereby increasing gas mileage. Computers also entertain (Bio Intelligence, 2008), creating digitized sound (Chan, 2009) on stereo systems or computer-animated features from a digitally encoded laser disc. Computer programs, or applications, exist to aid every level of education, from programs that teach simple addition or sentence construction to programs that teach advanced calculus.

Educators use computers to track grades and communicate with students; with computer-controlled projection units, they can add graphics, sound, and animation to their communications. Computers are used extensively in scientific research to solve mathematical problems, investigate complicated data, or model systems that are too costly or impractical to build, such as testing the air flow around the next generation of aircraft. The military employs computers in sophisticated communications to encode and unscramble messages, and to keep track of personnel and supplies. Students in advanced countries are exposing to all these technological change and schools in Ghana must follow the new trend in education.

2.5 Students' attitudes towards the use of Computer in Voc/Tech Institutions

Computer education is one of the latest technologies being employed in Schools. Students, therefore, are very much interested and they are very eager to learn about computers. In most of the schools especially Kumasi Technical Institute (KTI), there are computer laboratories and special teachers have been trained to teach students. During holidays, workshops and seminars are organized at schools or convenient places to introduce students to the use of computers.

People believe that girls do not take interest in technology education and for that matter it will extend to computing, but many girls of today rather like to work on the computer as secretaries. However, many girls are not seen at Vocational/Technical schools pursuing computer engineering. Statistics collected at the Kwame Nkrumah University of Science and Technology (KNUST) showed that few women offer computer science engineering but that does not mean that, girls do not like using the computer.

The American psychologist B. F. Skinner was influenced by these advantages when he developed his teaching machines in the 1950s. Skinner's concept of programmed instruction emphasized the need for a total educational plan. The process involved identifying objectives; arranging subject matter into logical sequences; preparing and testing instructional programmes; and then implementing, testing, and revising them [13].

Skinner shifted the emphasis in education away from the teacher's presentation of information and toward the learner's behaviour and, especially, reinforcement of that behaviour. His teaching machines provided programmed instruction, which allowed students to proceed through lessons by small steps, at their own pace, following an orderly sequence, and receiving immediate reinforcement for every correct response. Skinner's work emphasized the role of audiovisuals in facilitating individualized learning, [1]. This is a clear indication on how fast students learn with the things they practice with their hands. Student's attitudes towards the use of computer in vocational and technical institutions are very friendly and cordial.

2.6 Impact of Computer Education in Voc/Tech

The United States and other countries have begun to take advantage of the ability of audiovisual devices to transcend geographical barriers. Audiovisual devices can expose students to experiences beyond the classroom, and they can disseminate instruction across large areas, making education accessible to more people. In the U.S., communication satellites distribute educational programming to all public

television stations; some programmes are broadcast and others may be viewed on closed-circuit systems. India has also experimented with satellites to broadcast educational materials. In England, the Open University provides a college education by using radio, television, and regional learning centers. Other nations that have used audiovisual devices to transmit educational materials over large distances are France, Canada, and Brazil [12].

As the technology improves, educational capabilities increase correspondingly. The emergence of inexpensive computer technology and mass storage media, including optical video discs and compact disks, has given instructional technologists better tools with which to work. Compact disks (the CD-ROM and CD-I) are used to store large amounts of data, such as encyclopedias or motion pictures. At new interactive delivery stations with computers and CD-ROM, CD-I, or video discs, a student who is interested in a particular topic can first scan an electronic encyclopedia, then view a film on the subject or look at related topics at the touch of a button. These learning stations combine the advantages of reference materials, still pictures, motion pictures, television, and computer-aided instruction. With even newer technologies now being developed, such learning stations will eventually become common place in homes for both entertainment and educational purposes.

3. METHODOLOGY

3.1 Population

The target population for this study is Voc/Tech institutions with specific reference to some secondary technical and Voc/Tech schools in the Kumasi Metropolis. For this study, one technical institution; Kumasi Technical Institute (KTI), two Secondary Technical Schools, Kumasi Secondary Technical School (KSTS) and Armed Forces Secondary Technical School and one Senior High School; Ahmadya Senior High School were used. Since computer education of the child is the dual responsibility of the school and the home, the population for this study consisted of students, teachers in Voc/Tech institutions, teachers teaching ICT, parents, educationist and computer experts.

Table 3.1Breakdown of Population

		Selected Schools				
	Population	**Total Number**	**KTI**	**KSTS**	**Armed Forces Sec/Tech**	**Ahmadya SHS**
1.	Students	400	100	100	100	100
2.	Teachers	130	40	30	30	30
3.	ICT Teachers	80	20	20	20	20
4.	Parents	40	-	-	-	-
	Total Population	**650**	**175**	**150**	**150**	**150**

3.2 Sampling Technique

Considering the large sampling frame of about Six Thousand (6000), the researcher decided to use a sample size of Six Hundred and Fifty (650), representing approximately11% of the sampling frame. In selecting the sample size, all the elements in the sampling frame were taken into consideration. Data was collected from every case within the sample frame. Therefore a representative sample size of Six Hundred and Fifty (650) was arrived at. This consisted of One Hundred and Seventy Five (175) from Kumasi Technical Institute, One Hundred and Fifty (150) from each of the other institutions selected.

Random sampling was then employed to select from each of the strata. The simple random sampling method was used because all members of the population had an equal opportunity to become part of the sample. Dividing the population into a series of relevant strata means that the sample is more likely to be representative, as the researcher can ensure that each of the strata is proportionally represented. Sampling theory supports stratified random sampling as an efficient choice because the mean of the stratified samples are likely to be closer to the mean of the overall population [14]. Consequently, stratified random sampling is typically likely to reflect the characteristics of the population as a whole.

3.3 Data Collection Instruments

Two tools were used as the main data-gathering instruments to investigate teaching and learning practices in TVET Schools in the Kumasi Metropolis. Firstly, survey questionnaires were developed to collect data about the use of ICT tools in teaching and learning. Comparing Questionnaires and interviews, the later is more expensive and difficult to administer. Questionnaires allow confidentiality to be assured. The questionnaire was developed for the respondents covered by this research. To capture broad data about the usage of ICT in the schools selected, the questionnaire was designed to capture basic and technical data from respondents. The questionnaires were delivered by hand to each respondent and collected by the researcher and they were self-administered to the respondents.

A second questionnaire was developed for semi-structured interviews with the School heads, Directors of Education, teachers teaching ICT tools and some experts in computer engineering. Both close and open-ended questions were asked. Each interview was scheduled to last for approximately 40 minutes.

In order to test the validity of the questions used for the study, the researcher pretested the questionnaire to some teachers who are students at the University of Education, Kumasi. These respondents as well as their answers were not part of the actual study process because they were only used for testing purposes. After the questions have been answered, the researcher asked the respondents for any suggestions or corrections to ensure further improvement and validity of the instrument. The researcher revised the survey questionnaire based on the suggestion of the respondents. Reliability and validity are important aspects of questionnaire design. A perfectly reliable questionnaire elicits consistent responses [15]. Although it is difficult to develop, it is reasonable to design a questionnaire that approaches a consistent level of

response.

3.4 Data Analysis Techniques

The data analysis consisted of examining the surveys for correctness and completeness, coding and keying data into a database in Statistical Package for Social Scientists (SPSS), and performing an analysis of descriptive responses according to frequency distributions and descriptive statistics. Frequency tables and descriptive statistics were constructed to display results with respect to each of the research questions.

4. DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents data and the analysis of the results. The SPSS was used to carry out the analysis and the results presented in tables and charts. The total population for the study and responses received were six hundred and fifty (650). The results of the interviews with Directors of Education and Computer experts were handled differently. The researcher mainly dealt with the responses received from five categories of respondents who were students, teachers, the ICT teachers, parents, and educationists. The researcher also consulted proprietors, retired heads of institutions and retired directors of education. The results are presented in two categories. The first deals with the demographic characteristics of the population and the second part also assessed the descriptive statistics of the test results. Chi-square (χ^2) test was employed to test the association between some variables. Association was considered significant if the p-value was less than or equal to 0.05.

Table 4.1 presents the profile of respondents. Out of a total of 650 respondents surveyed, majorities (61.4%) were students, and 20% were teachers, 12.3% were parents and educationists and 6.3% were ICT teachers. Majority (87.2%) of the respondents were males as against few (12.8%) females. Very few (1.2 %,) of students were below 15 years or younger, the majority (62.2%) of the responded that they were between the ages of 16 and 18 years. Those between the age range of 19-21constituted 23.5% and less than one-fifth (12.5%) of the respondents were 22 years or older. Collectively, were surveyed 130 teachers. Few (5.4%) teachers responded they were 25 years or younger. More than half (53.8%) responded they were between the ages of 26 and 35 years with less than one third (31.5%) indicating they were between the ages of 36 and 45 years.

	Gender		Total	Chi-square (p-value)
Variables	Male	Female		
Age group				
Teachers				
< 25 years	5.6%	4.5%	5.4%	0.747 (0.862)
26 - 35 years	53.7%	54.5%	53.8%	
36 - 45 years	32.4%	27.3%	31.5%	
> 46 years	8.3%	13.6%	9.2%	
Students				
< 15 years	1.4%	.0%	1.3%	3.982 (0.263)
16 - 18 years	60.8%	74.5%	62.6%	
19 - 21 years	24.8%	15.7%	23.6%	
> 22 years	13.0%	9.8%	12.6%	
Program of Study				
Secondary	62.5%	100.0%	67.2%	28.466 (0.001)
Technical	37.0%	.0%	32.2%	
Other	.6%	.0%	.5%	
Parents and Educationists	80%	20%	100%	
ICT Teachers	56.2%	43.8%	100%	

4.2 Profile of Respondents

For the programme of study of students, those who reported that they attended Secondary school were 67.8% as against 32.2% who reported as technical students. A disaggregation of data into programme of study showed that the association between age group and the programme study used by the respondents was significant with the chi-square value (χ^2= 28.466 p-value = 0.001) majority of male students (62.5%) pursued secondary programmes as against about one-third (37%) pursuing technical programmes. All (100%) of the female students pursued secondary programmes. Majority (80%) of educationist and parents respondents were male as against 20% female counterparts. Most (56.2%) male ICT teachers as against 43.8% responded to the questionnaires.

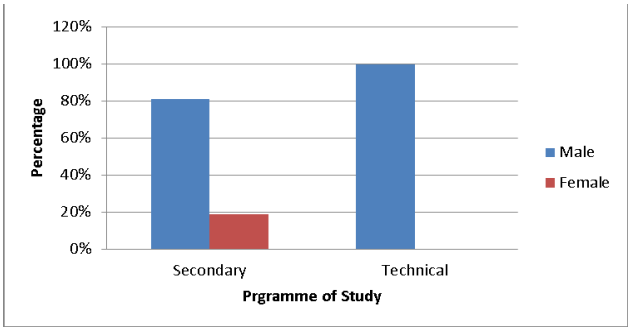

Figure 4.1Gender of Students by the Programme of Study

To identify student's school attended with regards to their programme of study, the respondents were requested to indicate the programme being studied in School.

Figure 4.1 depicts cross-tabulated results of programme of study of students by gender. An aggregation of the data into programme of study showed that the association between gender and programme of study was very significant with a Pearson's chi square value of 28.466. (p-value = 0.001). A comparative analysis of the result showed that few (20%) female respondents attended secondary school as against the majority (80%) male counterparts. The technical category also reported 100% male domination.

4.3 Necessity of Computer Education in Voc/Tech Institutions

The inclusion of ICT in Voc/Tech education programmes have been advocated by TVET curriculum developers. The respondents were therefore requested to indicate whether ICT education is necessary to their programme of study. The Tables 4.2 – 4.7 tries to identify when the students were introduced to computing in terms of age, and educational background of their parents with regards to their parents' highest qualification.

4.3.1 The ICT Background of Students and Parents' Educational Background

Table 4.2 Study of ICT by student father's highest educational qualification χ^2=16.330;p-value<0.001

Studied ICT before	Qualifications of parents				Total
	A	B	C	D	
Yes	76	112	49	31	268
	56.3%	78.3%	68.1%	77.5%	68.7%
No	59	31	23	9	122
	43.7%	21.7%	31.9%	22.5%	31.3%
Total	135	143	72	40	390
	100.0%	100.0%	100.0%	100.0%	100.0%

A= Middle/JHS level, B= O'Level/A' Level/SHS, C= Diploma/Degree, D=Masters and above

Source: Field Survey 2011

The ICT background of students based on their fathers' educational background is reported in table 4.2. From the Table, a total number of 268 representing 68.7% of respondents with diverse educational backgrounds from middle/JSS to masters' degree and above affirmed the importance of ICT education. However, a total 122 representing 31% of the same category disagreed with the idea. A disaggregation of data by students also revealed that, those whose parents hold A'levels/SHS (78.3%) and Masters Degree and above (77.5%) favoured ICT education. The majority (56.3%) of those who agreed were people with educational qualification of Middle/JSS levels as against 43.7% who answered in the negative. Fathers level of education was therefore significant as the trend was similar for all the other levels of qualifications (χ^2=16.330; p-value<0.001).

Table 4.3: Study of ICT by student mother's highest educational qualification χ^2=6.323;p-value=0.098

Study of ICT	Qualification of Parents				Total
	A	B	C	D	
Yes	125	84	48	7	264
	64.4%	70.0%	84.2%	70.0%	69.3%
No	69	36	9	3	117
	35.6%	30.0%	15.8%	30.0%	30.7%
Total	194	120	57	10	381
	100.0%	100.0%	100.0%	100.0%	100.0%

A= Middle/JHS level, B= O'Level/A' Level/SHS, C= Diploma/Degree, D=Masters and above

Source: Field Survey 2011

The association between programme of study and the recommendation for the inclusion of the subject in the curriculum was found to be significant (χ^2=6.323;p-value=0.098). Table 4.3 shows the students' backgrounds of computer studies with regards to their mother's educational background. From the table, majority (69.3%) indicated that the study of ICT is important. However, about one-third (30.7%) of the same responded did not find the study of ICT important. The trend is similar to that of the fathers (Table 4.2)

4.4 Unavailability of Qualified ICTTeachers

Here the researcher wanted to find out if there were qualified ICT teachers teaching the subject. To achieve unified growth and to bring small towns and cities as well as our students into the growing knowledge of technological advancement, there is the need to have qualified ICT teachers to handle the subject [2].

Table 4.4: Unavailability of qualified teachers to teach computing in Voc/Tec institutions by gender χ^2=6.535; p-value >0.05

Gender of Students	Availability of Qualified ICT Teachers					Total
	A	B	C	D	E	
Male	1	17	20	3	3	44
	50.0%	51.5%	69.0%	27.3%	75.0%	55.7%
Female	1	16	9	8	1	35
	50.0%	48.5%	31.0%	72.7%	25.0%	44.3%
Total	2	33	29	11	4	79
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

A= Strongly Agree, B=Agree, C= Not Sure, D= Disagree, E=Strongly Disagree

Source: Field Survey 2011

The ICT teachers were quizzed about the availability of enough ICT teachers to teach the subject. The results from Table 4.8 show that few (2) teachers strongly agreed with the statement that there were no qualified teachers to teach ICT. Majority (33) of the respondents agreed to the statement. Out of this number of respondents, 17 were males and 16 females, whereas 29 of them were not sure. However, 11 teachers which comprised 3 males and 8 females disagreed with that statement whiles 4 strongly disagreed, of which 3 were males and one female.

4.5 Availability of well Equipped Computer Laboratory in Voc/Tech Schools

For most developing countries, lack of access to well-equipped computer laboratories in Voc/Tech institutions is a barrier to network readiness.

Table 4.5:

Students with access to internet at home	Program of study			Total
	1	2	3	
Yes	112	27	0	139
	41.9%	20.9%	0%	34.9%
No	155	102	2	259
	58.1%	79.1%	100.0%	65.1%
Total	267	129	2	398
	100.0%	100.0%	100.0%	100.0%

A= Yes, B=No**Source: Field Survey 2011**

The respondents were requested to indicate if they had well equipped computer laboratories and access to internet in their various schools. According to Table 4.9, most (83.1%) male respondents agreed that, there are well equipped computer laboratories as against few (16.9%) female respondents who disagreed with the statement. From the results, 77 of the teachers indicated they had computer laboratories in their schools whereas 53 of them pointed out that they did not have computer laboratories.

4.6 Accessibility of Internet for Voc/Tech Students

Although a few recent studies have focused on the topic, accessibility of Internet for Voc/Tech Students, technology use in developing countries is fast moving target. In an attempt to verify if Voc/Tech schools have access to internet and how are they using the facility in the field of teaching and learning in Ghana? Internet penetration rates for developing countries such as Ghana have increased seven-fold. With regards to whether students have access to internet at home, the result was not significant (χ^2=17.984; p-value<0.001). It is interesting to note that, from Table 4.10, two-thirds (34.9%) of respondents indicated that they have access to internet in their schools. Majority (65.1%) of respondents have no access to internet at home with regards to their programme of study.

Table 4.6Students who have access to internet at home by programme of study χ^2=17.984; p-value<0.001

Students with access to internet at home	Program of study			Total
	1	2	3	
Yes	112	27	0	139
	41.9%	20.9%	0%	34.9%
No	155	102	2	259
	58.1%	79.1%	100.0%	65.1%
Total	267	129	2	398
	100.0%	100.0%	100.0%	100.0%

1= Secondary, 2=Technical, 3=Others

Source: Field Survey 2011

Table 4.6 further revealed that, out of these figures, students from secondary schools had more interest in internet browsing as compared with their counterparts in the technical schools. In all, about one-third (41.9%) of students from secondary school had access to internet as shown in the table. The table depicts that 155 students representing 58.1% from secondary schools had no access to internet at home and a total of 102 students representing 79.1% from technical schools also had no access to the internet at home.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summaries of Findings of the Study

The findings of the studies are summarized below:

5.1.1 Lack of qualified ICT teachers

Gender of Teachers	Response (Yes/No)		Total
	A	B	
Male	65	43	108
	84.4%	81.1%	83.1%
Female	12	10	22
	15.6%	18.9%	16.9%
Total	77	53	130
	100.0%	100.0%	100.0%

The study revealed that, the majority (71.3%) of the respondents agreed that, there are no qualified teachers mainly trained on technical programmes such as LOGO, AutoCAD, Autodesk, Siemens and the like. It further confirmed that ICT penetration rate in the developing countries have increased seven-fold but the lack of qualified teachers to teach it may retard the intended progress.

5.1.2 Accessibility of Internet services in Voc/Tech with regards to Technology

It is interesting to note that, from Table 4.10, two-thirds (34.9%) of respondents indicated yes. Majority (65.1%) of respondents have no access to internet at home with regards to their programme of study. Out of these figures, students from secondary schools have more interest in internet browsing as compared to their counterparts in the technical schools. In all, majority of students have no access to internet as shown in the Table 4.10.

5.1.3 Availability of well Equipped Computer Laboratory in Voc/Tech Schools

The result of the study revealed that, contrary to the general perception that, there are not well equipped computer laboratories in Voc/Tech institutions, the majority (71%) of respondents indicated positive.

5.1.4 Funding of Computer Education in Voc/Tech Institutions

The results clearly indicated that, majority (93%) of the respondents said it is the government sole responsibility to make sure that, schools in the country, be it secondary or technical should be well equipped with every facility to enhance teaching and learning. However, they quickly added that, parents and teachers association (PTA) can also help if the need arise. The results of the research also showed that donor agencies and NGOs should help provide computers for Voc/Tec School.

5.1.5 Necessity of Computer Education in Voc/Tech Institutions

The study revealed that, the inclusion of ICT education in Voc/Tech educational programmes have been advocated by TVET curriculum developers and almost all the Voc/Tech Schools have started ICT education but they are yet to write standard examination on it.

5.1.6 Importance of ICT Education to Parents and Students

Most (76.5%) students considered the computer as very important to their studies as against few (2.1%) students who sees computers as not important at all. Majority (70.9%) of students whose parents hold Middle/JHS level qualification are the majority in the schools studied as compared to parents who hold Masters Degree and above. Few (2.3%) parents and students consider computer education as less important.

5.2 Conclusions

Ghana is a country which has benefited from diverse aspects of ICT tools including Voc/Tec education, engineering, medicine, agriculture, business and many more, but all will not be complete if at this stage ICT education is only introduced to few people. Right now, computers are used everywhere and the more you use the computer, the more you become efficient in using it to solve problems. Also all stakeholders in education should join in the crusade of introducing ICT in the curriculum of Voc/Tech Institutions. Students who go to the advanced countries to study find it very difficult to operate the computer. Voc/Tech students, should therefore, be exposed to ICT education and be encouraged to use it well. This is because most of the industries that need high technological skills require computer knowledge in their companies.

Frantic efforts should be made by the government to encourage the use of ICT tools in Voc/Tec Institutions by providing logistics and supporting materials that will enhance the study of ICT in Voc/Tech institutions. It would even be better for ICT education in our Voc/Tech Institutions to be examinable at final examinations.

Finally on my rounds, I realized that there are no concrete plans by the Ministry of Education and the GES to provide the needed logistics for ICT education in Voc/Tech Institutions, though, they appreciate the use of ICT tools. All hands must be on deck to uplift the image of Ghana. There is need for Voc/Tech education to be upgraded to the international standards to help our graduates to find work around the globe.

5.3 Recommendations

In considering the findings made and also the issues raised in the conclusion, the following recommendations are being made:

1. Every teacher in Voc/Tech Institution should be computer literate. There should be aggressive efforts by all stakeholders in education to ensure that the teacher themselves are computer literate.
2. Following from the above, the training of teachers to teach computing in Voc/Tech Institutions should start now.
3. Technical programmes such as Computer Aided Design (Auto CAD) should be installed and taught in Voc/Tec Institutions to enhance student's creativity and suitability for the global job market.
4. Every Voc/Tec institution must have at least two computer laboratories to facilitate the teaching and learning of ICT tools.

5.4 Recommendations for Future Research

The research is of great importance to the nation and should be pursued further to find lasting solutions to how computing can be fully made part of the curriculum of Voc/Tech education. The following recommendations have, therefore, been made for future research on the topic.

1. This topic should be taken to a higher national level and researched into because if serious attention is not paid to it, a lot of Voc/Tec students will be trained but there will be no job for them.
2. The whole research involves a lot of travelling and movement to seek information and it was really expensive because getting material was a big problem.
3. It is therefore my hope that these laudable suggestions would be taken seriously and attended to, to save our youth in Voc/Tech schools in the near future.

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