International Journal of
Recent Innovations in Academic Research
Open Access, Peer Reviewed, Abstracted and Indexed Journal

E-ISSN: 2635-3040; P-ISSN: 2659-1561
Homepage: https://www.ijriar.com/
Volume-5, Issue-11, Nov-2021: 14-39

Case Study

The Integration of ICT as a Core Subject in Secondary Schools in Sierra Leone-A Case Study (Eastern Region, Kenema City)

Ahmed Tejan Jalloh

Lecturer, Eastern Technical University of Sierra Leone, Kenema-Sierra Leone, West Africa
B.Sc. Business and Information Technology (First Class), M.Sc. Information Systems Management (Ongoing); Email: ahmedtejanjalloh2017@gmail.com

Received: October 18, 2021 **Accepted:** October 31, 2021 **Published:** November 6, 2021

Abstract: The integration of information and communication technology (ICT) as a core course or subject in all Secondary Schools has advanced over the last two decades. ICT has changed the quality of education, and it is clear that students now expect ICT as part of their learning experience. Many current forms of information and communication technology may be effective as a teaching resource if used wisely and meaningfully. It is therefore important for educators to understand how to best use ICT in teaching and learning. Having ICT in the education environment does not automatically ensure that high quality effective teaching and learning take place. The teachers' role, students and principal are all-important here. To improve the use of ICT in the educational environment we need to understand teacher perspectives so that we can improve teachers' ICT skills, and in many cases, change their perceptions about ICT. This research sought to address the following research question: what are teachers' perceptions regarding integrating ICT with pedagogy in the classroom? The findings presented in this dissertation represent some Sierra Leone secondary technology teachers' perspectives on integrating ICT. The findings show that teachers use various ICT tools to differing degrees, depending on their perspectives relative to ICT and their level of professional experience in ICT use. Teachers are integrating ICT in instructional processes and see the future as highly ICT integrated. They use a variety of ICT tools, for example the Internet, digital cameras, video cameras and video players, computers, printers, scanners, data show, presentation, educational software, CAD and electronic boards. In order to integrate ICT meaningfully into classrooms teachers need both the commitment and the technological skills to do so. Teachers understand their need for skills improvement and believe in undertaking such development, but they have a lack of time to achieve it. The Ministry in charge was also forwarded with recommendation on what to put in place to have it effectively integrated into the learning systems. The government has considered it important to enact a policy that all secondary schools should offer ICT as a compulsory subjects in order to achieve the whole benefits derivable from its integration. The ICT infrastructure should be equipped and have personnel's with the necessary skills to train the ICT teachers in these schools.

Keywords: ICT, learning experience, professional experience.

Introduction

The worldwide integration of information and communication technology (ICT) into Secondary school level education has advanced significantly over the last two decades. People have always tried to use technology to meet their needs (Ministry of Education, 1995), and today new technologies appear almost daily. Educators, community, government and local authorities all place great importance on integrating ICT advances into education (Harrison, 2005). Much of the discussion concentrates on upgrading resources, rather than meaningfully integrating ICT in Secondary School

classrooms. Many current forms of information and communication technology can become effective teaching resources if used wisely and meaningfully. If used ineffectively they will waste considerable amounts of money. Therefore it is important for educators to understand how to best use ICT in teaching and learning. If we do not understand the effective use of ICT in the classrooms, expenditure on computers, software, whiteboards and the likes, it will be meaningless in terms of teaching and learning. While it may change a teacher's role (for example, supporting students to use an individual computerized learning program), it will not alter pedagogy (Cuban, 2002). To achieve this, teachers must believe in ICT as a valuable educational tool, make a commitment to improving their ICT skills, and integrate ICT into their regular teaching practice. Today's new technologies cannot be ignored in the school context. As the researcher explored further, it shows that ICT integration in the classroom can influence learning and teaching. Modern communication technologies are an integral part of most students' lives. If educators embrace ICT, educational content and methodology may become more relevant to students actual careers and interests. Cox and Abbott (2004) found that students enjoyed using ICT to help them take more responsibility for their learning. Their commitments to the learning task and interest in the subject improved. Using ICT allowed them to be more independent. In the case of young people who have lacked access to ICT technologies (like personal computers) it can be argued that schools should provide them with the opportunity to use and learn about them. Much economic and professional development depends on being able to confidently use ICT. Currently, the Ministry of Basic and Senior Secondary School Education seeks to better incorporate ICT into our secondary schools.

Background of the Study

The Ministry of Basic and Senior Secondary School Education (MBSSCE) has deemed necessary to integrate ICT into the learning and training processes of all secondary schools in Sierra Leone effective this academic year. All heads of schools have been fully informed of the integration and that all schools must include ICT as a core subject. Curriculum and syllabi have been set up and approvals are all in place. ICT has been seen over the years as a driving tool for any career development and Secondary Schools must not be an exception. It is in Secondary School that we must allow our pupils to choose their future career. The use of ICT at this level will help the pupils execute their intentions for whatever they would want to be. ICT use in schools in Sierra Leone has not been fully instituted to actualize and realize the benefits derivable from ICT integration in almost every portion of their process in the schools. Pachler suggested that pupils need to be prepared well for using the Internet. They need to be clear about intended learning outcomes and have clearly differentiated tasks to work on. Accordingly, students can be developed as highly motivated and successful learners, provided that schools do not implement ICT superficially with existing classroom curricula and pedagogies, using it to make their schools appear modern without ensuring the efficacy of its usage. ICT has changed the quality of education and it is clear for many educators that students are changing by using ICT tools (Finger *et al.,* 2007). In Sierra Leone, a survey of the computer skills and knowledge of most students and teachers showed that ICT was not fully implemented and integrated into their learning and training processes.

Statement of the Problem

ICT should be fully integrated in the secondary schools across the nation for the challenges of the 21st century education to be met. Despite the endeavors to integrate ICT in education, a number of issues have remained as barriers to full attainment of the desired goals. These include: limited access to dedicated high-speed systems of connectivity to allow access to e-mail and internet educational resources for most secondary schools; ineffective implementation of ICT integration in education policies due to multiple actors involved in integration of ICTs in education; wanting capacity of education managers and teachers to effectively use of ICT as a pedagogical and management tool; emphasis on digitizing science content at the expense of other areas of learning, inadequate ICT infrastructure for teaching and learning; and inadequate monitoring and evaluation of ICT integration in education initiatives in secondary schools. ICT has not been much integrated in most Secondary Schools, due to the fact that its benefits have not been well deciphered to the pupils, administrators

and teachers. The IT infrastructure in these schools was not encouraging. Literature studies (Tedla, 2012 and Makgato, 2012) revealed that the successful integration of ICT in teaching and learning largely depends on teacher competency, availability of ICT infrastructure and teachers. How effective is ICT in assisting the teaching process is yet to be known in these secondary schools that the researcher selected, so this study intended to address the experiences of teachers in using ICT in their teaching focusing on: benefits of using ICT to facilitate teaching, barriers of using ICT to facilitate teaching and factors determining the use of ICT to facilitate teaching in five selected secondary schools of the Kenema District, Eastern Region.

Significant of the Study

The introduction of ICT in education has a lot of benefits. Haddad and Draxler (2005) posit that ICT make valuable contribution to various aspects of education development and effective learning through expanding access, promoting efficiency, improving the quality of learning and enhancing the quality of teaching. According to Tinio (2003), appropriate use of ICT allows for collaborative learning where students interact with other students, teachers and experts regardless of where they are.

Purpose of the Study

This study investigated teachers' experience on the use of ICT to facilitate teaching and integrating it in five (5) selected secondary schools in Kenema district.

Aim of the Study

The study aimed building a knowledge base of perceptions of teachers on the use of ICT to facilitate teaching. The knowledge may serve as a guide for overcoming challenges that teacher's face while using ICT to facilitate teaching in secondary schools. The study also will contribute to the existing literature on the integration of ICT as a core subjects to facilitate teaching process and pupils career building in secondary schools.

Objectives of the Study

The study was guided by the following objectives:

i) To integrate ICT course in the school curriculum.
ii) To identify the challenges faced by the selected school in integrating ICT in course curriculum.
iii) To proffer suggestions, recommendation and solutions towards the full integration of ICT.

Research Question

The study was guided by the following research questions:

i) What are the benefits of integrating ICT to facilitate teaching process in secondary schools in Kenema District?
ii) What are the barriers of integrating ICT to facilitate teaching process in secondary schools in Kenema District?
iii) What are the factors determining the integration of ICT to facilitate teaching in secondary schools in the district?

Limitations of the Study

Some questions of innovation and teaching practices relied on the level of ICT knowledge of the respondents and some respondents had limited knowledge owing to their level of ICT awareness. This was solved by use of contingency question items such that one only responded to items that applied to him or her. An observation checklist was also be used to confirm, where it was possible, the veracity of responses in the questionnaire items. Again, owing to the nature of technology explosion and rapid changes taking place in education, the ICT integration situation in secondary schools in the district may change rapidly within a short span of time, rendering the study to be obsolete. However, the findings may still be useful as a baseline for future study to assess the extent of such change.

Review of Other Related Literatures

Meaning of ICT

The acronym ICT stand for Information and Communication Technology and is defined as a "diverse set of technological tools and resources used to communicate, to create, disseminate, store and manage information (Blurton, 1999). These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephone. Teaching process is a means through which the teacher, the learner, the curriculum and other variables are organized in a systematic manner to attain pre-determined goals and objectives. Information and Communication Technology is at the very heart of the educational process, consequently ICT-integration in education has a long history. Much has been written about the use of film, radio, telephones, and television in education (Nag, 2011). Because access to digital tools, applications, and networks continues to grow worldwide and media are increasingly available in digital form, use of ICT in education is expected to increase dramatically. As stated by Daniels (2002) ICT have become within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. As described in the United Nations, (2017) report ICT cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities.

The various kinds of ICT products available and having relevance to education are such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counseling, interactive voice response system, audiocassettes, video and audio tapes and CD ROMs. Moreover, Information and Communication Technology has a profound effect on the progress and development of human civilization. The tools used in ICT include computer programs, databases, communication networks, analysis and design methods of programming languages, artificial intelligence, knowledge bases, etc. It has long standing influence in almost all areas of human activity (Ashikuzzaman, 2014). According to the United Nations Development Programme (UNDP), in Mavellas, Wellington and Samuel (2015, p. 3), "ICTs are information handling tools. That is, a varied set of goods, applications and services that are used to produce, store, process, distribute and exchange information. They include the 'old' technology of radio, television and telephone, and the new ICTs of computers, satellite and wireless technology and the internet. These different tools work together and combine to form a massive infrastructure of interconnected telephone services, standardized computing hardware, the internet, radio and television which reaches into every corner of the globe". This means that the notion of ICT is a complex one and its use is quite varied especially when it comes to education. Ang'ondi (2010) takes this further by looking at the use of ICT from a different angle. She argues that ICT plays a major transformative role in the improvement of all aspects of national life; politics, business, economics, education social and cultural development. Ibenegbu (2018) in the same vein comments that ICT is a universal tool for globalization which brings people together within a short space of time without the difficulties that accompany transportation and other logistics that are associated with the movement of people from one place to another. Since people are able to network seamlessly through the internet, the level of professionalism is raised in the academic community as academic professionals, share current information as they arise. This therefore implies the necessity of acquiring the necessary skills and knowledge in the application and practice of ICT for teachers and students. Jeffels (2009) concurs with this when he argues on the relevance of ICT on the global scale, when he posits that ICT is a global phenomenon, and children who are computer literate at an early stage of their lives might deal better with the modern world. Researchers are of the opinion that the tools of ICT in schools are diverse and it is beneficial to both students and teachers. According to a survey conducted by UNESCO schools use a diverse set of ICT tools to communicate, create, disseminate, store, and manage information. In some contexts, ICT has also become integral to the teaching (UNESCO, 2018). While UNESCO explicates the benefits of ICT to teaching, Volman (2005) in Mikre (2011)

looks at the use of ICT in education as it contributes to a more constructivist learning which increases the activity and greater responsibility of students to meet goals that are consistent with the demands of modern day society.

The Concept of ICT Integration

Integrating ICT into teaching and learning is not a new concept. It may be as old as other technologies such as radios or televisions. However, with the rapid development of emerging technologies, such as web technology, ICT integration has increasingly attracted the attention of educators. Technology should be used not because it is available or it has been shown effective in some cases. It should be used to enable the process and enhance learning because inappropriate use of technology can lead to negative effects (Russel, 2018). Integration has a sense of completeness or wholeness (Earle, 2002), by which all essentials elements of a system are seamlessly combined together to make a whole. In education, simply handing out to students a collection of websites or CD-ROM programs, taking your students to the computer lab once a week or using an electronic worksheet is not necessarily ICT integration. In a properly prepared ICT integrated lesson, ICT and other crucial educational components such as content and pedagogy are molded into one entity. As a result, the objective of the lesson may be achieved, but if the ingredients are taken away from the ICT integrated lesson, the quality of the lesson would be somehow be diminished (William, 2003). Instead, technology is integrated when it is used in a seamless manner to support and extend curriculum objectives and to engage students in a meaningful learning. It is not something one does separately; it is part of the daily activities taking place in the classroom and campus. Based on the above, within the education sector in Sierra Leone, ICT is defined as the seamless incorporation of technology to support and enhance pupils' engagement in meaningful learning and for attainment of curriculum objectives. ICT integration is more of a process rather than a product. The computer should be fitted into the curriculum not the curriculum into the computer (Earle, 2002). Therefore, effective ICT integration should focus on pedagogy design by justifying how the technology is used. Effective ICT integration into learning process has the potential to engage learners. Additionally, ICT can support various types of interactions in the learning environment: learner–content, learner-learner, learner-teacher and learner-interface. These types of interactions make the learning process more interactive and learners become more active and engaged (Wong *et al.*, 2006).

The term Information Communication Technology (ICT) has had a long history in its evolution process. According to Pelgrum and Law (2003), towards the end of 1980's, the term 'computers' was replaced by ICT (Information Communication Technology). This signified as shift of focus from computing technology to the computers and enhances capability to store and retrieve information. This was followed by the introduction of the term 'ICT' around 1992, when e-mail started to become available to the general public. The concept of Information Communication Technology consists of three words. The term 'Information' refers to any communication or representation of knowledge such as facts, data or opinion in any medium. 'Communication' is an integral part of human existence. It refers to the process of transferring information from a sender to a receiver with the use of a medium in which the Communication Information is understood by both. 'Technology' is the practical form of scientific knowledge or the science of application of knowledge. Therefore, Information Communication Technology (ICTs) are commonly defined in education as 'a diverse set of technological tools and resources used to communicate, create, disseminate, store and manage information (Blurton, 2000). These technologies include computers, the internet, and broadcasting Technologies (Radio and Television), and (Mobile) telephony. Basically ICT is a tool. It can be hardware (such as Computers, Digital cameras), software (such excel, discussion forum) or both.

Utilization of ICT in Primary and Secondary Schools in Africa

Farrell and Shafika (2007) argue that several governments have taken the initiative to ensure that ICT is utilized effectively in the primary and secondary education sectors of their country. Most of these nations have taken the initiative to develop policies in this direction. Farrell and Shafika (2007) continue that there is a great deal of variance in ICT policies for education among the African

countries. In some countries like South Africa there are clear policies guiding the use of ICT in schools, as well as the future of education within the nation as technology enhanced learning becomes the order of the day. North Africa on the other hand has also developed policies and have both resources and high bandwidth connectivity with Europe have ensured that they make considerable progress in the implementation of their ICT plans (Isaacs and Naidoo, 2003). Those countries that are steadily moving to sustainable economies (Mauritius, Ghana, and Botswana, for example) constitute another group making remarkable progress.

Farrell and Shafika (2007) argue that perhaps the largest group is made up of those countries that are in transition from a sustained period of conflict and economic instability and are looking to ICT applications to help them meet myriad challenges—particularly the development of their human resource capacity. They are among the neediest in terms of assistance (Isaacs, 2005). However, there remains a group of countries that are still plagued with political instability and internal conflicts that make progress on the ICT for education agenda impossible. Farrell and Shafika (2007) continued that most countries have, or were in the process of, liberalizing their telecommunications policies to enable more competition and diversity of service providers in the industry. This wave has evident manifested across most African countries with a few exceptions. While this is having the effect of lowering the cost of access to information and telecommunication infrastructure, the costs of connectivity remain unaffordable for most education institutions (James, 2004). Furthermore, there are huge gaps between urban and rural schools in terms of access to ICT infrastructure. Access to a reliable supply of electricity is a general problem but is particularly severe in rural areas because of the difficulty of connecting to national electrical grids. UNESCO (2015, p. 12) posit that One of the critical issues undermining ICT use in Africa, has been a lack of access to electricity. According to UIS data, access to electricity in primary schools in many Africa nations, such as Burkina Faso, the Democratic Republic of Congo, Malawi and Tanzania, is less than 20%. Data from Sierra Leone from 2012 on access to electricity in educational institutions indicates that only 3% of primary schools and 16% of lower secondary schools have access.

Electricity at the household level is similarly bereft. They estimate the 'direct connect' rates to electricity in Sierra Leone are only 5% (11% in urban areas; 1% in rural areas). In contrast, Botswana, Djibouti and South Africa have electricity in 75% of primary schools while both Seychelles and Mauritius have 100% access in primary schools, the latter being consistent outliers in UIS data. Some form of access to electricity is a precursor for all ICTs, and therefore the widespread areas of energy poverty across sub-Saharan Africa represent a fundamental barrier to ICT use, not just in education, but for society in general. Also Countries like Nigeria, Cameroon, Chad, and recently South Africa amongst others where access to stable electricity especially in the rural areas is a major challenge more and more schools are increasing finding it difficult to make use of ICT facilities even if they have them because of inadequate power. There is a general lack of human resource capacity to provide ICT training and equipment servicing, and there is also a lag between the availability of ICT infrastructure and the ability of agrarian societies to integrate it to benefit national development. Djibouti, for example, is at the forefront with a digital telecom network with two earth stations and the landing point for three undersea cables linking to Asia, the Middle East, and Europe (Farrell and Shafika, 2007). However, the country has yet to develop an ICT education sector policy and has generally not yet benefited from these assets. Primary and secondary schools play an important role in providing ICT literacy education and developing information technology competencies, or cognitive and operational skills and attitudes necessary for the effective use of information and communication technologies (Rambousek *et al.,* 2014). This means that, the introduction of ICT in primary and secondary education is the bedrock of learning everything about information technology and its utilisation. Although, few countries in Africa have fully adopted the use of ICT in impacting knowledge in both primary and secondary schools, some scholars are of the opinion that ICT has not been effectively utilized in Africa (Farrell and Shafika, 2007). This is because the level of ICT proficiency among African students is relatively low. Adomi and Kpangban (2010) concur when they argue that fifty five percent of students within the continent, including

Nigeria, Algeria, Burkina Faso, Cameroon, Republic of Congo, Egypt, Gabon, Lesotho, Mali, Mauritius, Mozambique, Rwanda, Senegal, South Africa and Uganda had no experience at all in using computers. Other findings of the study revealed that the typical African school environment provides neither opportunity nor training in using ICTs, and that 75 percent of responding teachers have no or very limited experience and expertise regarding ICT educational applications. Using Nigeria as a case study, the Federal Government of Nigeria, in the national policy on education (Federal Republic of Nigeria, 2004), recognises the prominent role of ICT in the modern world, hence the integration of ICT into the education curriculum. To actualise this goal, the document states that government will provide basic infrastructure and training at the primary school. In an attempt to improve computer literacy in the educational sector at the junior secondary school level, computer education has been made a pre-vocational elective and a vocational elective at the senior secondary school (Adomi and Kpangban, 2010). The introduction of this in the national policy in 2002, after it was discovered that chalkboard and textbooks were still dominant in most classrooms of Nigerian and Algerian schools. Despite putting plans in place for computer literacy, there are constraining factors which still hinder the implementation of ICT in education. In Algeria, for example, the problem of poor infrastructure and connectivity issues in addition to limited learning materials pose serious challenges to the actualization of ICT based teaching and learning (Asongu and Odhiambo 2019).

Oliver (2002) points out the necessity to migrate from the content-centred curricula to competence-based curricula. This movement is closely is associated with improving the teacher-centred forms of delivery to student-centred forms (Samarakoon *et al.,* 2017). This means that with the introduction of ICT, a rich environment that promotes and motivates learning is ensured. This position is supported by Kisirkoi (2015) who avers that the effective use of ICTs as a teaching and learning agent has been found to significantly increase student's achievement which promotes critical thinking and problem solving skills. Kisirkoi explains that researchers are in agreement that the use of ICT in education as instructional media does not only enhance learning outcomes but, it is also crucial in preparing the youth for the challenges that come with globalization. More so, with the use of ICTs in schools, students gain the much-needed confidence to embark on meaningful research with their teachers and contemporaries (even with those in other countries) to solve technological problems (Kisirkoi, 2015).

In Africa, the provision of ICT facilities poses a big challenge as many schools lack the bare necessities for an ICT based learning. As Mndzebele (2013) remarks, what has helped schools to have computers are foreign donors and aid from companies that donate ICT facilities as a form of their corporate social responsibility project. With the help of non-governmental organisation and other foreign bodies, ICT have made its grounds in Africa. Mndzebele locates the problem which schools in the continent wrestle with within the area of implementation. In an attempt to find a way out of this unpleasant scenario, Rambousek *et al.,* (2014), propose that computer-based applications for learning such as word processing, be used in place of papers. Furthermore, teaching aids which incorporates slides and projectors should replace the old order of writing boards in the classroom. Also, the prospect of virtual learning was mentioned as a way of not only bridging the gap between students and teachers in different parts of the world but also expanding the scope of learning beyond the walls of a classroom.

Benefits of Using ICT in the Teaching Process

Several studies from case studies to survey researches have been conducted about the importance of ICT and why teachers use it. ICT can play various roles in learning and teaching processes. According to Bransford *et al.,* (2000), several studies have reviewed the literature on ICT and learning and have concluded that it has great potential to enhance student achievement and teacher learning. Wong *et al.,* (2006) point out that technology can play a crucial part in supporting face-to-face teaching and learning in the classroom. Many researchers and theorists assert that the use of computers can help students to become knowledgeable, reduce the amount of direct instruction given to them, and give teachers an opportunity to help those students with particular needs. According to

Gillespie (2006), new technologies can be used to enable students to collect information and interact with resources, such as images and videos, and to encourage communication and collaboration. Osborne and Hennessy (2003) identify that new technologies may also help to increase student motivation, facilitate clearer thinking, and develop interpretation skills with data. BECTA (2003) indicated that the success of the integration of new technology into education varies from curriculum to curriculum, place to place, and class to class, depending on the ways in which it is applied. Here under are a few highlighted benefits of using ICT to facilitate teaching.

Barriers That Hinder Teachers from Using ICT in the Classroom While Teaching

The act of integrating ICT into teaching is a complex process and that one may encounter a number of difficulties. Schoepp (2015) defines barrier as any condition that makes it difficult to make progress or to achieve an objective. There are several factors that inhibit the integration of ICT into classroom instruction. Some factors are school base (internal) while some are community base (external) and teacher's personal issue. Researches identify these factors as non-manipulative and manipulative factors. Non-manipulative refers to the factors, such as age, teaching experience, computer experience. Manipulative factors are availability of ICT infrastructures, government policy and the availability of external support; attitude, phobia, interests, skill level in using computer etc.

Teachers' Attitude towards the Use of ICT

Knowledge, Skills and attitude is a predisposition to respond favorably or unfavorably to an object, person, or event (Ajzen, 1988). To successfully initiate and implement ICT in teaching depends strongly on teachers' support and attitudes. Among the factors that influence successful integration of ICT into teaching is teacher's attitudes and beliefs towards technology (Hew and Brush, 2007). Attitudes toward ICT influence teachers acceptance of the usefulness of technology, and also influence whether teachers integrate ICT into their classrooms. Many theorists (e.g., van Braak, 2001b; Vannata and Fordham, 2004) have maintained that teachers' attitudinal factors have a strong impact on technology integration in teaching. Attitude is an important concept in social judgments and behaviors and thus, is one of the most important concepts in decision making (Venkatesh *et al.*, 2003).

Teacher attitude is one of the most critical factors that enhance or inhibit the integration of ICT into classroom instruction. In a report by BECTA (2004) on ICT integration in education was reported that negative attitude was a barrier towards integration of using ICT in teaching while Rhoda and Gerald (2000) found that positive attitudes towards ICT integration are widely recognized as a necessary condition for effective ICT use in teaching. Moreover Selewyn (1999), insists that integration of ICT in teaching depends to a great extent, on teachers' attitude towards their use. Myers and Halpin (2002) assert that attitude of teachers towards ICT use is a major predictor of future classroom use. Furthermore a study by Bullock (2004) found that teacher's perceptions are a major enabling/disabling factor in the implementation of ICT based teaching approach. Similarly, a study by Kersant *et al.,* (2003) found that teachers, who have positive attitude towards ICT based teaching feel more comfortable with using it and usually exploit it in their teaching. Essentially, Woodrow (1992) asserts that any successful implementation of ICT based teaching and learning approach requires the development of positive teacher's attitude toward information and communication technology.

Teacher Competence and Confidence in Using ICT to Teach

ICT competence is defined as being able to handle a wide range of varying technologies for various purposes. According to Prestride (2012) ICT aided teaching is the most appropriate skill required of a teacher, unfortunately, it is the least possessed by many. This may be because it is barely been part of their training course. Prestride (2012) outlined some of ICT packages required of a secondary school teacher as data processing, word processing, use of internet, use of spreadsheet, use of presentation software like PowerPoint and e-mail. These ICT packages are important to teachers because they assist in creating lesson plans, analysing and setting students' tests, acquiring new

knowledge and presenting lesson in a clear way among others. According to Bordbar (2010) teacher's computer competence is a major predictor of integrating ICT in teaching.

According to Al-Oteawi (2002) majority of teachers who reported negative or neutral attitude towards the integration of ICT into teaching and learning processes lacked knowledge and skills that would allow them to make "informed decision". A study by Peralta, and Costa, (2007) suggest that teachers with more experience with computers have greater confidence in their ability to use them effectively. To conclude, Jones (2004) reported that teachers competence relate directly to confidence. Teachers confidence also relate to their perceptions of their ability to use computers in the classroom, particularly in relation to their children's perceived competence. A very significant determinant of teachers' levels of engagement in ICT is their level of confidence in using the technology. Teachers who have little or no confidence in using computers in their work will try to avoid them altogether (Dawes, 2000). According to BECTA (2004), much of the research proposes that this is a major barrier to the uptake of ICT by teachers in the classroom. Some studies have investigated the reasons for teachers' lack of confidence with the use of ICT.

Beggs (2000) asserted that teachers' "fear of failure" caused a lack of confidence. On the other hand, Balanskat *et al.,* (2006) found that limitations in teachers' ICT knowledge makes them feel anxious about using ICT in the classroom and thus not confident to use it in their teaching. Many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of children who perhaps know more than they do. On the other hand, teachers who confidently use technologies in their classrooms understand the usefulness of ICT. Cox *et al.,* (1999) found that teachers who have confidence in using ICT identify that technologies are helpful in their teaching and personal work and they need to extend their use further in the future. Another barrier, which is directly related to teacher confidence, is teachers' competence in integrating ICT into pedagogical practice BECTA (2004).

In Australian research, Newhouse (2002) found that many teachers lacked the knowledge and skills to use computers and were not enthusiastic about the changes and integration of supplementary learning associated with bringing computers into their teaching practices. Current research has shown that the level of this barrier differs from country to country. In the developing countries, research reported that teachers' lack of technological competence which is a main barrier to their acceptance and adoption of ICT (Pelgrum, 2001). In Syria, for example, teachers' lack of technological competence has been cited as the main barrier (Albirini, 2006). Muriithi (2005) has argued that in Kenya like most developing countries ICT usage is still limited to computer literacy training. Both the findings show that teachers who do not use computers in classrooms claim that "lack of ICT skills" is a constraining factor preventing teachers from using ICT for teaching. Hence, lack of teacher competence may be one of the strong barriers to the integration of technologies into education. It may also be one of the factors involved in resistance to change.

Limited Access to ICT Facilities

Access to ICT infrastructure and resources in schools is a necessary condition to the integration of ICT in education. Inaccessibility or unavailability of ICT, a school level barrier, has been identified as a key obstacle that impedes teachers from using ICT in teaching. Shortage of resources includes different factors, such as lack of access to hardware and software, poor quality hardware and inappropriate software. Effective adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware, software, etc. Obviously, if teachers cannot access ICT resources, then they will not use them.

Therefore, access to computers, updated software and hardware are key elements to successful adoption and integration of technology. Several research studies indicate that lack of access to resources, including home access, is another complex barrier that discourages teachers from integrating new technologies into classrooms (Bingimlas, 2009). A study by Yildrim (2007) found

that access to technological resources is one of the effective ways to teachers' pedagogical use of ICT in teaching. Access to hardware and software is not only important, but also the use of suitable kind of tools and programme to support teaching and learning (Tondeur *et al.,* 2008). The inaccessibility of ICT resources is not always merely due to the non-availability of the hardware and software or other ICT materials within the school. It may be the result of one of a number of factors such as poor organisation of resources, poor quality hardware, inappropriate software, or lack of personal access for teachers. The level of access to ICT at school is defined as teachers' access to infrastructure, provision shortages and inadequacy, and teaching time using ICT.

Dealing With Today's Students

To understand the position of ICT in secondary school settings and pedagogy, we need to focus on the nature of secondary pupils and how their youth culture reflects the new environment of the 21st century, for teaching and learning. Prensky (2001) has observed that: Today's students have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones and all the other toys and tools of the digital age. Today's average student have spent less than 5,000 hours of their lives reading, but over 10,000 hours playing video games (not to mention 20,000 hours watching TV). Computer games, email, the Internet, cell phones and instant messaging are integral parts of their lives. Bolstad *et al.,* (2006) stated that it should be noted that the concept of a digital generation is most relevant for Westernised, technologised nations where there is fairly widespread access to such technologies. The digital generation could be considered to be the first generation to grow up surrounded by digital environments (Tapscott, 1998). Also, Bolstad *et al.,* (2006) added that even within western nations, there are questions about possible social and economic digital divides between those who do, and those who do not have easy access to technology tools. The impact of digital technologies in the last two decades had such a profound impact on all aspects of individual life that it will inevitably have shaped the ideas, hopes and behaviours of those who have grown up before the digital age (Bolstad *et al.,* 2006). They added that this change made a massive impact on social, economic, and cultural development as these young people begin to assume situations of power and responsibility in their transition to maturity (p. 12). The popular media, market research, social science research and people's everyday experiences shape general ideas and beliefs about what today's young people do with ICT, or what technology is doing to them (Bolstad *et al.,* 2006). They added that the prolific use of digital technologies for communication or entertainment has often been represented in the media as harmful or at least contributing little towards the growth of young people's ability to think and learn. Many academics have commented in support of this view about the harmfulness of ICT. Sefton-Green, for example, suggested that opinions in favour of young people's ICT use often float free from any discussion of the concrete realities of children's lives, or their actual uses of these new technologies (Sefton-Green, 1998, p. 2). Discussions about the digital generation also have a tendency to homogenise students, implying that they act in particular ways. Betrus *et al.,* (2008) argued against this and mentioned the advantages of ICT in education, highlighting the social nature of much of today's technology. Because technology like a cell phone or computer is useful to young people socially (in that it helps them communicate with others) they will learn more when they use it in an educational context. When learning is fun and relevant to one's life, more learning is done. Bolstad *et al.,* (2006) argued that "Yet, for every book, magazine cover, or headline that cautions about the risks that digital technologies cause for young people's health, development and education, there is a writer seeking to convey the opposite" (p. 14). This message holds that adults have it all wrong and that digital technologies (and the wider popular culture of which they are an integral part) are actually helping young people to become smarter, savvier and more powerful.

Johnson (2005) argues that the much-maligned tools of popular culture like video games and television can be used to discover-order and meaning in the world and make-decisions that help create that order. Another supporter of the learning potential of popular forms of multimedia digital ICT is Prensky (2006). Prensky is one of many educationists who suggest that several answers to current problems in education (for instance student's disconnection from school in discussing this

prevalent view, Wallis (2006) described a time magazine cover depicting a pre-teen youngster staring ahead with a blank expression, his ears plugged with the headset of an iPod, while a swirl of electronic gadgets orbited his head. The headline asked: ARE KIDS TOO WIRED FOR THEIR OWN GOOD? learning could be solved if parents and educators would listen to what the children of the electronic age-whom Prensky calls-digital natives-already know, can do, and can learn with technology.

Authors such as Gee (2003) and Lankshear and Knobel (2003) suggested that educationists should take a fresh look at the ICT that young people are already engaged with-such as video games and online forums-and consider how these embody principles of powerful and effective learning. They argued that educators need to lead secondary school students to integrate ICT meaningfully. My perspective is that ICT can be used effectively to support student learning because it is interesting and relevant to today‘s generation, and it enables independent learning. However, parents and educators need to guide young people to ensure they are using today’s technologies appropriately. This has significant implications for teachers and their use of ICT in their classrooms.

Governement Commitment to ICT Integration in Secondary Schools in Sierra Leone

ICT Policies

A. National

A national policy on ICT is almost non-existent at the present time. However the policymaking process began in 2006 and it is expected to be finalised in 2007. A Telecommunications Act of 2006 has, however, been passed and has set the pace for the establishment of a regulator the National Telecommunications Commission (NaTCom), with responsibility for licensing and spectrum management among other things.

B. Education

The absence of a national ICT policy has equally affected the ICT in education policy. However, provisions for ICT utilisation are embedded in the National Science and Technology Policy 6, with assertions such as making science and technology education compulsory in the basic education system by integrating it into the curricula of all schools and at all levels. The policy also states that “the rapid development and exploitation of ICTs shall be targeted.” At the same time, the National Education Master Plan 1997–2006 outlines plans for upgrading teachers through the use of distance education. In support of distance education and learning aided by ICTs, the government’s reform initiatives include restructuring and upgrading of the School Broadcasting Unit in support of the 6-3-3-4 system. An upgraded Educational Broadcasting Division has been proposed to replace the School Broadcasting Unit. One of the objectives of the new proposed division is to produce and deliver quality educational radio and television programmes to complement and enrich lessons in formal and non-formal education classes.

Directorate of Science Innovation and Technology of Sierra Leone

‘Sierra Leone, like many African countries, has a very young population coming of age during the Fourth Industrial Revolution: an era both defined by rapidly emerging new digital media and by complex global challenges, including climate change, migration and widening economic inequities. Advances in science, technology and innovation are shaping the world faster than many industries and governments can or know how to react. Artificial Intelligence (AI), Internet of Things (IoT), Blockchain, Quantum Computing, Biotechnology, Bioinformatics, and 3D Printing are some of the emerging technologies transforming the global economy, security and governance. These technologies, coupled with rapid automation, will create entirely new jobs while eliminating or significantly modifying many existing traditional sectors. This means all countries and governments must be prepared to be digital, and should create platforms for citizens to participate in this global economy. This transition to being digital led by Government and its partners, must be agile, well-directed, abundantly resourced, and critically secure. It should be accompanied by a vision that is developed with and for the people who will benefit from it.

The Government of Sierra Leone (GoSL), under the leadership of His Excellency President Julius Maada Bio, has developed a 10-year National Innovation and Digital Strategy (NIDS) (2019-2029) aimed at guiding Sierra Leone's investments, policies, and governance frameworks for the country's present and future development. NIDS situates Sierra Leone among regional and global leaders in the field of digital agile governance by focusing on effective service delivery, citizen engagement, and the digital economy driven by innovation and entrepreneurship. Such a transformation will reduce the cost of governance and reduce corruption while increasing national productivity. While there are concerns about the security, privacy, and widening inequality driven by rapid advances in technology, GoSL believes these technologies will significantly enhance our humanity–enabling humans to focus more on the things that make us human.

These advances will help public service leaders make effective data-driven decisions and help them to better connect with their constituents. This Act provided the mandate for establishing the institutions to implement the ICT transformation of Sierra Leone under the supervision of the Ministry of Information and Communication. The 2006 Telecommunications Act was followed by an ICT Policy developed in 2009. A 2017 update to that Policy added to it Cyber security and e-Government frame works. In 2018, President Bio established the Directorate of Science, Technology and Innovation (DSTI) in the Office of the President and appointed Sierra Leone's first-ever Chief Innovation Officer to lead it. DSTI's vision is simple: to use science, technology and innovation to help the government deliver on its Medium Term National Development Plan (MTNDP) and to establish Sierra Leone as an 'Innovation Nation'–a nation where agile, exploratory and research-driven startups and initiatives led by people of all ages can problem solve at the appropriate scale, and within the right economic, policy and regulatory frameworks.

Methodology

Qualitative Research

"Is an umbrella concept covering several forms of inquiry that help us understand and explain the meaning of social phenomena with as little disruption of the natural setting as possible" (Merriam, 1998, p. 5). Generally speaking, qualitative researchers attempt to describe and interpret human phenomena, often in the words of selected individuals (the participants) (Merriam, 1998). Qualitative procedures stand in contrast to the methods of quantitative research. Merriam (1998, p. 9) described five characteristics of qualitative research:

- ✓ Qualitative researchers are interested in understanding the meaning people have constructed.
- ✓ The researcher is the primary instrument for data collection and analysis.
- ✓ The researcher must physically go to the people, setting, and site (the field) in order to observe behaviour in its natural setting.
- ✓ Qualitative research primarily employs an inductive research strategy.
- ✓ The product of a qualitative study is richly descriptive.

Research Design

A research design is the structure of research. It holds all the elements in a research project together. It shows how all the major parts of the research project work together to try to address the central research question Kombo and Tromp, (2006). The study adopted a descriptive survey design.

Kombo, (2006) defines descriptive survey as a method of collecting information by administering a questionnaire to a sample of individuals in order to secure evidence concerning all existing situations, and comparing the present conditions for the next cause of action. Descriptive survey was suitable since this study sought to determine the integration of ICT access and usage in the various teaching and learning activities in secondary schools in Kenema.

Sample Size and Target Population

The pupils, teachers and administrators are the target population for this research in the various five (4) secondary schools identified for this study**.**

S. No.	School	Targeted Number
1	Government Secondary School Kenema	20
2	Islamic Secondary School Kenema	20
3	Holy Trinity Secondary School Kenema	20
4	Ahmadiyya Muslim Secondary School Keneam	20

Data Collection

In qualitative research, data collection occurs with a natural environment. The researcher in this methodology normally goes to the site (home or office) of the participant to guide the research. Therefore the researcher met the ICT teachers at their schools. This was suitable for the research because by directly meeting the participants at their schools to get more in-depth information in their own surroundings.

Davies (2007) explained that qualitative research relies on a researcher‘s performance as an interviewer and on their skills as a critical interpreter of the data gathered. Davies added that qualitative research can be related to some complex areas of psychological, philosophical and sociological argument revolving around questions such as:

- ✓ How do we know what we know?
- ✓ How do we know what other people feel?
- ✓ Is what people say different from what people do?
- ✓ How can researchers interpret their findings without bringing into play their own Perspectives derived from their own gender, age or life experiences?

These questions were useful to me as I attempted to understand technology teachers ‘perceptions in the interviews, and then later in my analysis. Purposive sampling is an important strategy in qualitative research. Purposive sampling selects for information-rich cases which can be studied in depth (Patton, 1990). This data came from four secondary schools in Auckland city; the deciles (socio-economic character) of these schools ranged from three to ten. My goal was to see ICT integration in different settings: how teachers used ICT tools and the quality and availability in these schools. However, I found that these four schools were generally similar in their levels of ICT integration and infrastructure. Also, I wanted to understand how teachers think about ICT integration in their work life during a normal working day. I wanted to identify the complex ways that teachers integrate ICT in their teaching and assess its effectiveness.

In qualitative research, data collection may be carried out through interviews (Merriam, 1998) thorough observation and administering questionnaires.

Ethical Consideration

Permission was requested and granted to carry out the exercise in these schools. They were even honored to have been put in the exercise as a case study citing that other academic stakeholders would decipher the technological problems faced by them and possible remedy could be considered by those concerned.

Analysis of Data

Using the interview as a foundation, the researcher analyzed the teacher’s comments for themes and patterns, and looked for similarities and differences in perspective. The researcher used SPSS and excel tools to do the general analysis of the collected data from the respective respondents.

Research Quality

It is a firsthand data as the researcher did not only rely on secondary data, but got almost all responses directly from the respondents through the administered questionnaire, interviews and observation conducted.

Internal Validity and Reliability

All research is concerned with making valid and reliable knowledge in an ethical manner (Merriam, 1998). Merriam added that being able to trust research results is significant to professionals in applied fields, such as teaching and learning. There are some challenges to ensure trustworthiness of qualitative research (Merriam, 1998, p. 202). I dealt with these challenges in many ways. The researcher chose six teachers from different decile schools to get a wider perspective and a variety of opinions about the role of ICT in education. Even though I regarded ICT positively, I tried not to communicate this to the participants in the interview, for example, I tried to ask neutral questions in the interview. The aim was to find out what teachers believed relative to my research questions. The researcher told participants that this research will be confidential.

Results and Discussion

Use of ICT across the Curriculum

It had been described, at the outset of this study the school was well-equipped with new technology through the new build scheme. Throughout questionnaire and interview responses from support and teaching staff, there is a willingness to make use of ICT across the curriculum. This is evidenced by 99% of teacher questionnaire responses stating that the use of ICT is important in delivering 'good' lessons. However, 80% of teachers also identified the need for their department to develop the use of ICT further. It was noted that first order barriers, in terms of access and reliability of equipment did not appear to occur here.

Analysis of teacher questionnaire data found that 98.5% of staff stated that the ICT provision of the school is better than average. Through interview, fifteen teachers and five members of the SLTU were asked how they found the ICT provision and technical support. All respondents identified the provision as good or excellent and seventeen identified that technical support ensured reliability of equipment. This section will make use of data collected through lesson plan analysis, staff questionnaire and interview data along with student questionnaire and interview data to identify how ICT is used to support teaching and learning across the school. It will be shown that there is variation within and between departments in terms of how ICT is used. In terms of explaining this variation, evidence collected here suggests that teachers' confidence in their own ICT skills can make a difference in terms of how they expect students to use ICT.

Table 1. Distribution of gender, age and form

Details		**Frequency**	**Percentage**
Gender	Male	50	62.5
	Female	30	37.5
Total	2	80	100
Age	Below 13	10	12.5
	14–16	15	18.75
	17-20	55	68.75
	3	80	100
Have you received any computer training	Yes	25	31.25
	No	55	68.75
	2	80	100
Number of students in both JSS III and SSS III	SSS III	40	50
	JSS III	40	50
	2	80	100

The table above depicts the distribution of male and female in the selected schools which showed that more male students participated. Equal number of students from both JSS III and SS III

participated to get equal responses from all levels. Most consented to have never received an ICT training in their schools. Most of the school going pupils in the Junior secondary school fall with age bracket of 14-16 while in senior secondary schools fall between 17-20.

Table 2. Respondents distribution of how well can you do each of these tasks using a computer

Details	Scale	Frequency	Percentage
Connecting computer cables to electricity and switching ON or OFF a computer	Very Good	15	18.75
	Good	5	6.25
	Average	10	12.5
	Weak	10	12.5
	Poor	40	50
Total		**80**	**100**
Operating with Word processor	Very Good	10	12.5
	Good	10	12.5
	Average	5	6.25
	Weak	10	12.5
	Poor	45	56.25
Total		**80**	**100**
Information browsing and downloading	Very Good	5	6.25
	Good	5	6.25
	Average	5	6.25
	Weak	40	50
	Poor	25	31.25
Total		**80**	**100**
Operating with PowerPoint presentation and Excel	Very Good	15	18.75
	Good	5	6.25
	Average	10	12.5
	Weak	10	12.5
	Poor	40	40
Total		**80**	**100**

To determine the competency or confidence of the learners on some ICT skills students were asked to rate themselves on a likert scale of very good, good, average, weak and poor. Skills tested included, skill on connecting cables to a computer and switching the computer on or off, operating with word, skills on internet use including browsing and downloading information, use of spreadsheets and presentation application like PowerPoint demonstration as well as student's skills in networking or communicating with their colleague on facebook and twitter.

The level of student competency as shown on table above was analyzed in terms of level of confidence expressed by students whereby those students who rated themselves as either good or very good in a given skill were regarded to have high confidence in that skill while those rating themselves as from average to poor were regarded to have low competence hence low confidence in the performance of such tasks. Majority of the students demonstrated greater confidence on two operations connecting computer cable to the electricity and switching ON and OFF a computer and networking e.g. Facebook and twitter. In all the other skills tested, majority of students demonstrated low level of confidence or competency whereby a majority of them rated themselves on a level between average and poor. This indicates that more need to be done in terms of improving the skills of the student hence enhancing their confidence in application of the skills in their learning activities.

Table 3. Distribution of student's responses on how often they are taught ict during normal classes

Details	Scale	Frequency	Percentage
How often ICT is taught in your school	Always	20	25
	Sometimes	20	25
	Rarely	40	50
	3	**80**	**100**
Is ICT course a compulsory subject in your school	Yes	20	25
	No	25	31.25
	Not Sure	35	43.75
	3	**80**	**100**
Is there any ICT tutor	Yes	20	25
	No	20	25
	Not sure	40	50
	3	**80**	**100**

From the table above, it is clearly shown from responses collected from the selected schools that ICT is not often taught due to many reasons depicted by the participants. One of the major reason highlighted were, lack of qualified ICT tutor and ICT is not part of the school curriculum. Efforts were on the way to putting all of these to an end.

ICT Supporting Tools for Teaching

In this section it is shown that the use of ICT to support teaching, including administration tasks and the preparation and presentation of materials, is important to teachers but that there are some areas for development in terms of the use of ICT to support assessment and analysis of data. Lesson plans for one day were used to support findings from teacher questionnaire, interview and observation data in terms of how ICT is used to support teaching and learning. The content of these lesson plans were analyzed and planned uses of technology were identified, then divided into teacher-led use of technology or student-led use of technology. Teacher uses and student uses were then broken down into different activities. According to findings basic ICT tools were available but the number of items per school was low as most schools had only one of each item indicating that the tools were available but not adequate. It was only printers that were reported to be more than one in some schools.

Table 4. Available ict tools in the selected schools

Details	School	Frequency	Percentage
Laptop	GSSK	8	23.52
	ISSK	9	26.47
	HTSSK	8	23.52
	AMSSK	9	26.47
	4	**34**	**100**
Printer	GSSK	8	23.52
	ISSK	9	26.47
	HTSSK	9	26.47
	AMSSK	8	23.52
	4	**34**	**100**
Projector	GSSK	3	20
	ISSK	3	20
	HTSSK	6	40
	AMSSK	3	20
	4	**15**	**100**
Modems	GSSK	5	26.31
	ISSK	3	15.78
	HTSSK	6	31.57
	AMSSK	5	26.31
	4	**19**	**100**

The table about depicts the number of available ICT tools in the various targeted schools. The mostly available is Laptop having an equal amount of availability. According to table above basic ICT tools were available but the number of items per school was low as most schools had only one of each item indicating that the tools were available but not adequate. It was only printers that were reported to be more than one in some schools.

Table 5. Level of Ict tutor's qualification

Details	Scale	Frequency	Percentage
Proficiency level e.g. workshop, seminar, apprenticeship Certificate e.g BECE, or equivalent Diploma Degree	Workshop	30	37.5
	Seminar	10	12.5
	Apprenticeship	1	1.25
	Certificate	30	37.5
	BECE	1	1.25
	Diploma	5	6.25
	Degree	3	3.75
	7	80	100

Table above shows that the majority of the principals had proficiency level of training (workshop, seminar, apprenticeship) only had higher level training on ICT being holders of Diplomas in ICT. They have not received any form of training. Proper training on ICT is essential for all principals and teachers as being leaders, they form key change agents. They also influence individual school ICT policy and financing. When those who reported to have trained on ICT integration in the TTC/Universities were further asked to rate their ICT integration training in terms of equipping them with skills in their subjects like lesson planning, lesson delivery and lesson presentation as shown in table. Most of the respondents indicated it was slightly relevant while few indicated it was just relevant. The findings of the study echoed those obtained by Kiptalam and Rodrigues (2010) who found that majority of teachers did not receive any prior ICT training during the formative years at the Teacher's Training College or university before joining the teaching profession. Some teachers stated that they did not receive any ICT training at all in TTC or University they attended whereby few of these teachers had taken self-initiative to undergo ICT training over the past three years they had been employed in the teaching profession.

Table 6. Means of acquisition of ict tools

Details	Frequency	Percentage
1. From school funds (PTA, school fees)	20	25
2. Government donations	40	50
3. From private donations (NGOs, Companies)	20	25
Total	**80**	**100**

It is quite clear that most of the support come from the government while fund from charitable organizations. The highest is from the government to ensuring the nation gets it deserved educational level by all means.

Attitude of Students towards Ict Integration

To determine the attitude of students towards ICT Integration, students were provided with statements to rate them on likert scale of strongly agree (SA) agree (A), undecided (U), disagree (D) and strongly disagree (SD) as shown above, whereby just like in the case of teachers, for the positively stated statements, majority of students responded as either strongly agree (SA) or Agree (A) while for those negatively stated statements they responded as either Disagree (D) or Strongly disagree (SD). Student's opinion was further sought regarding value of ICT integration in their learning whereby students in an open ended questions were asked to indicate how computers have influenced the way they learn and what they learn. Most students indicated that use of computers and

related technology had made their learning enjoyable and that they were able to learn for more hours without getting bored, they also indicated that computers and especially the internet has enabled them get access to a lot of information. Others indicated that they were able to access past papers for revision through web based platforms. Generally, these indicate that students had high interest on ICT integration.

Challenges Facing the Implementation of Ict Integration in Secondary Schools

To establish the challenges or barriers to ICT integration in Kenema District, teachers were asked to rate on a likert scale of major, minor or not a challenge a number of potential challenges. Their responses were as summarized indicate that most teachers were of the opinion that lack of adequate computer laboratory was not a challenge to ICT integration while technophobia (fear of working with computers) was a minor challenge to a small majority. All the other ten challenges listed were rated as major challenges by most of the teachers. Teachers also added that the conservative nature of some of them whereby most teachers are traditionally used to do it. Serious enquiry was a potential inhibiting factor to ICT integration as well as the fact that there is little pressure and rewards mechanisms in their schools to challenge the status quo. Generally, the findings implied that despite the efforts expended towards ICT integration policy by the government as well as individual schools, obstacles to the implementation were still to a large extent in existence.

Discussion and Recommendation

In this chapter important themes from the research data are discussed. These relate to the ways in which teachers are using ICT, strengths and weaknesses, integrating ICT into the classroom, the opportunities and challenges of teaching with ICT, and reviewing the curriculum with actual teacher practice. The researcher presented the suggestions of the teachers interviewed regarding how best to integrate ICT in teaching and learning. Lastly, comparing the experience of teachers in Sierra Leone with regard to integrating ICT with current practice in other African Nations and make suggestions as to how the Ministry of Education could best integrate ICT into secondary education.

Technology Teachers and the Integration of ICT

All participants mentioned that they integrated ICT into the classroom because they believed that ICT was an important tool in learning and teaching. Also, all participants thought that in future, ICT in schools will be central to every aspect of school life. ICT will change the way teaching and learning happens in the classroom. Macho (2005) mentions that some researchers argue there is no evidence that using ICT in education will improve student learning. All participants disagreed with Macho and believed that integrating ICT does improve student learning. Arguably, technology teachers are particularly placed to improve ICT use, because it is naturally part of their subject.

The researcher considered the teachers' responses, using Betrus *et al.*, (2008) definition of using managing and creating appropriate ICT in learning. Interestingly, the teachers interviewed talked about how schools should integrate ICT through such words such as using and managing appropriate ICT, but only one of them mentioned creating ICT. Betrus *et al.*, (2008) pointed out that there are no resources to use or manage unless someone first creates them. Betrus *et al.*, (2008) stated that Creating ICT means creating instructional materials, learning environments, and larger teaching learning systems. Betrus *et al.*, (2008) classification applied to integration activities. Seels and Richely (1994) have a wider view, and use the terms design development, and evaluation to refer to the function of creating resources for learning.

Teachers Perceptions Regarding Integrating Ict into Pedagogy

The teachers outlined by noting that much consideration should be that of the principal goal for ICT use and facilitation of more effective and higher value education in a shorter time period. The participants identified the main ICT tool in secondary schools as the Internet, so when they spoke about the advantages and disadvantages of incorporating ICT into teaching and learning processes they often talked about the strengths and weaknesses of the Internet. From the teachers ‘perspectives,

the following perceived strengths and weaknesses of integrating ICT into pedagogy can be identified:

Strengths of Ict Integration

ICT can be Student-Centered and involves active learning in the classroom environments of the teachers however learning became more student-centered when ICT was used. This was most effective when the teacher-to-student ratio was low enough for teachers to be available to guide the students. When leaning becomes more student-centered, students will develop new ways of thinking, and acting in the education system (Khine and Fisher, 2003), for example, students may read more on the Internet than in books. Multiple Viewpoints Encourage Critical Thinking. With the Internet, students can see a multiplicity of viewpoints on a single issue or subject. Khine and Fisher (2003) and Bolstad *et al.,* (2006) agreed with the participants that teachers can guide students to think more critically about information and to develop ways of assessing it. This encourages intellectual enquiry and evaluation skills. Many researchers have argued that regular use of ICT has the potential to empower secondary students to develop new ways of thinking, being, and acting in the world, and to gain learning goals. However, Khine and Fisher argued that ICT usage may guide young people to become more inactive, more introverted, and less able to use their brains. My perspective is that integrating ICT encourages thinking if educators lead the learning processes. ICT can Promote Student Engagement and Encourage Participation in the Learning Process. The teachers noted that multi-media programs (using sound, image and animation) were a lot of fun for students and as such engaged them fully. Students therefore spent more time reading and writing when using such interactive programs than they would without them. This supports students' use of ICT and engagement with technology to plan and achieve education goals and to use the Internet to find new ideas (Harrison, 2005).

Sierra Leone Curriculum and Teachers' Perspectives

Overall, the teachers interviewed with regards the current curriculum, stated that the ICT could help encourage students to be innovative and think deeply about issues. They also spoke about the large degree of change that the subject of Technology has undergone. Some were feeling unsure about the new curriculum and were still developing ways of delivering it. They talked about what a huge workload this has been for technology teachers. New teachers may be confused about what they should teach in the technology curriculum, and they need more curricular clarification from the Ministry of Education. This confusion may affect the integration of ICT. The Ministry of Education ICT Strategic Framework for Education (2006) states that the vision is to improve learner achievement in an innovative education sector, fully connected and supported by the smart use of ICT. To actually achieve this vision, all ICT teachers need post graduate diploma to construct their knowledge through experience and connect with other technology teachers inside Sierra Leone and all over the world. To improve the use of ICT in the ICT curriculum we need to improve teachers ICT skills and in many cases change their perceptions about ICT. Researchers have emphasized that teachers must be equipped with the necessary knowledge and skills to achieve the effective integration of ICT in education (Galanouli *et al.,* 2004; Jedeskog and Nissen, 2004; Cope and Ward, 2002).

The Future of Ict in Education

The teachers all had different perspectives about the future of ICT in education. However, they all thought that ICT tools would eventually replace books and paper. The greatest opportunity for integrating ICT in teaching and learning lies in the ways in which technology or ICT can improve students learning not only within the schools but also with the school and its educational partners such as parents and community (Finger *et al.,* 2007). Thus, the role of the virtual learning environment will increase. Now digital natives use many ICT tools (Prensky, 2006) like games, email, searching, IM, blogs, wikis, podcasting, polling, PSP, networking, texting, digital cameras and GPS. While these tools are largely used in social networking, they could be more integrated into the curriculum. Mobile media raises the possibility of a new teaching and learning approach. Wagner

(2005) summarized: mobile learning represents the next step in a long tradition of technology mediated learning. It will (incorporate) future new strategies, practices, tools, applications, and resources to realize the promise of ubiquitous, pervasive, personal, and connected learning (p. 44). ICT may also be used to manage student movements and performance. For example, students will have an electronic card to swipe when they arrive at school, and schools will send instant messages to parents to inform them of their child's truancy. To sum up, the researcher thinks the ICT integration in education will continue to increase. Internet tools like educational websites will continue to be useful for students and educators. New ICT tools such as Website will transform learning and teaching methods and may improve students learning.

Rationale for Ict Integration in Sierra Leone

The current discussion centres on determining whether or not we need to integrate ICT into our educational context. Most arguments in favour of integrating ICT reflect a desire to use it so that our schools appear modern. While our infrastructure may look effective, often the actual educational application of the technology is lacking. In the researchers view, school systems in Sierra Leone need to accept the necessity of ICT and instead begin to discuss how to best implement it throughout our educational system. A clear strategy needs to be developed in order to best help our teachers and use our resources wisely. The time for window-dressing with ICT is over because our students will lead the country in the future and need a deeper and wider understanding of ICT. Sani (2002) suggests that the successful integration of ICT as a course into the Secondary School level system can greatly contribute to the development of a nation's economy. This integration would create more capable employees.

Teacher Perspectives and Recommendation

Teacher perspectives on the need for ICT integration mixed feelings. Currently, teachers tend to think that it will take a long time to integrate ICT and they assume that the required level of professional development will be too onerous. Many teachers do not see why they should work hard to develop professionally. Although some of the teachers that they did not have time for ICT Professional Development, they could always see the point in doing it. Also, the Ministry of Education actually insisted that all teachers should do. The researcher recommends that the Ministry of Education needs to play a stronger role in encouraging teachers in this process.

Infrastructure

In comparison with Ghana, Sierra Leone has a good ICT infrastructure, and school systems encourage educators and learners to use it in appropriate ways, for example, one of the schools that the researcher visited in some computers for students. Additionally the schools visited have a variety of ICT tools aside from computers, including access to the Internet and an internal network.

Recommendations to the Ministry of Basic and Senior Secondary Schools of Education Regarding Effective Ict Integration

Schools hold the responsibility to integrate ICT into education based on the research. The researcher **recommended** that the following steps should be considered for effective integration of ICT as a core course in all secondary schools:

- ✓ Develop an ICT strategic framework for education and apply it in practice in schools. Unfortunately the government has lots of funding, there is no clear sense of direction regarding equipping ICT teachers.
- ✓ Hire ICT professionals to support the necessary infrastructure implementation.
- ✓ Establish links with the private sector at the highest levels, to ensure the best possible support (e.g. forging a partnership with Microsoft, getting ICT discounts etc.)
- ✓ Work to change teacher beliefs about ICT from a generally negative view to a positive one that understands the necessity for implementing ICT. It is the attitude and skill level of the teacher that determines the effectiveness of ICT integration into education. Therefore educators must be provided with the opportunities for lifelong training and development in ICT integration.

- ✓ Ensure Internet safety to soothe fears about the negative content that is available on the Internet (e.g. create filters to keep out materials that are incompatible with School environments).
- ✓ Provide the funds to create an effective infrastructure and develop teachers' capacity in ICT. As one of the flagship program of the government the can make a good infrastructure, so the Ministry of Education needs to act more purposefully to create an effective infrastructure and change teachers perspectives about integrating ICT in their pedagogy and treat it as core course.

Conclusion

The researcher spoke with teachers and were having positive beliefs about integrating ICT into their classrooms. They integrated ICT into both their planning and their instructional activities in a way that enhanced student learning. They identified useful approaches for improving ICT integration in the future. Based on the conversations with teachers in this study and reflections on the data the researcher would recommend these measures for Sierra Leone:

- ✓ Government and schools increase opportunities for PD during school time.
- ✓ Teachers continue to improve their ICT skills, especially with Web 2 and mobile technologies and develop deeper understanding of appropriate pedagogical uses.
- ✓ Ministry of Education provides more funds for ICT infrastructure.
- ✓ More computer programmes and creative uses of ICT are planned for gifted students.
- ✓ Schools make ICT central to every aspect of their life to increase a successful integration of a wide range of new ICT tools for teaching and learning.
- ✓ The Ministry of Education resolves confusion about the new technology curriculum by increasing opportunities for training ICT teachers.

Conflicts of interest: There is no conflict of interest of any kind.

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Citation: Ahmed Tejan Jalloh. 2021. The Integration of ICT as a Core Subject in Secondary Schools in Sierra Leone-A Case Study (Eastern Region, Kenema City). International Journal of Recent Innovations in Academic Research, 5(11): 14-39.