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The Use of ICT in the Teaching and Learning Process in Secondary Schools:

A Case Study of Two Cameroonian schools

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Appreciation

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Abbreviations

ICT: Information and Communication Technology

TK: Technological Knowledge

CK: Content Knowledge

PK: Pedagogic Knowledge

TCK: Technological Content Knowledge

TPK: Technology Pedagogic Knowledge

PCK: Pedagogic Content Knowledge

TPACK: Technology Pedagogic and Content Knowledge

UNESCO: United Nations Educational, Scientific and Cultural Organization

OECD: Organization for Economic Cooperation and Development

OLPC: One laptop per child

CIAC: Computer Integration Across the Curriculum

ICAC: Integration of Computer Across the Curriculum

PTA: Parents Teachers Association

SSL: Spreadsheet Supporting Learning

MPTP: Multimedia Portable for Teachers Pilot

EFA: Education For All

IICD: International Institute for Communication and Development

CD: Compact Disc

DVD: Digital Versatile Disc

TIMSS: Trend in Mathematics and Science Study

BECTA: British Educational Communications and Technology Agency

G.C.E: General Certificate of Education examination

NAICT: National Agency for Information and Communication Technologies

PDF: Portable Document Format

MOOC: Massive Open Online Courses

SMS: Short Message Service

FCFA: Franc Communauté Financière Africaine

NGO: NON-Governmental Organisation

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1 INTRODUCTION

ICT stands for Information and Communication Technology and defined as a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information (Gunton, 1993; Victoria, 2002). ICT is divided into two main approaches in education such as; ICT for education and ICT in education. ICT for education implies the development of information communication technology for learning and teaching purpose while ICT in education involves the adoption of general components of information and communication technology in practical use in teaching and learning processes (Voogt & Pelgrum, 2005; Watson, 2006). Today, technology has increasingly become a vital element for firms to compete and develop. Ajayi (2008) highlighted that the world of today is considered as a global village through the use of ICT in different educational, political, economic and social sectors. Almost in all situations or tasks, we find the integration and the use of technology to solve problems. Accordingly, future teachers need to equip and acquaint themselves to make changes brought about by technology (Cuban, 2001; Kozma, McGhee, Quellmalz & Zalles; 2004; Philip, Oluwagbemi, & Oluwaranti, 2010; Voogt 2010; Voogt, 2013).

Today, the limitations of distance have been broken by technology. A teacher can have several students all over the world through virtual classrooms. With the use of phones, Skype and other devices alike the teachers and students can easily get connected making it possible for teaching and learning to take different innovative platforms. It is seemingly difficult, if not impossible, to address quality education without making mention of the use of ICT. ICT is considered as one of the pillars upon which quality education for all can indeed

become a reality, because of its unique capacity to bring the world together, even the most remote and disadvantaged of communities (Ndongfack, 2010). Cuban (2001) in his book "Oversold and Underused: Computer in Classroom" suggests that technology will always play a major role in this 21st century and more than ninety percent of jobs created now will require advanced technological training. He further explains that for students in this generation to compete for future jobs, they must have adaptive skills in the use of ICT.

The introduction of ICT into schools and in the learning process was driven by global forces which are beyond the school-based decision making (Voogt, 2010; Voogt, 2013; Philip, Oluwagbemi, & Oluwaranti, 2010; Cuban, 2001). The expansion of technology across a wide range of areas including educational institutions, schools and universities came with the main intention of improving the teaching and learning environment (Al-Qahtani & Higgins, 2012). From the origin, the implementation of ICT in education was to transform the teaching and the learning process from the traditional instructional teacher-centered endeavour to a learner-centered approach with active participation of the learner coach (Voogt, 2008; Voogt & Pelgrum, 2005; Voogt 2010; Voogt et al., 2013). These researchers emphasised that the teacher`s job was to organise the classroom and gives students more opportunities and control over learning.

Furthermore, one of the distinguished researchers Shulman (1986) was credited with his notion of *pedagogic content knowledge (PCK).* To ensure effective teaching in the classroom; usually, the teacher is subject to have good *content knowledge* about his domain and the various approaches to delivering their lessons *(pedagogic knowledge).* Shulman´s claim was later developed by Mishra and Koelher (2006) who elaborated that ICT can be used to support the content and pedagogic knowledge of the teacher for effective educational practices in the classroom. Mishra and Koelher (2006) introduce the TPACK model (*Technological Pedagogic and Content Knowledge)* also known as the "total package" to equip 21st-century teachers with all skills needed to function in their classrooms.

Voogt & Pelgrum (2005) supported the idea that curriculum needs to be reformed for students to develop competencies that will help them survive in this 21st century. What we may consider as an important ICT learning tool today, might be seen as outdated in some few years to come. Consequently, we have to open our minds and move along with the technological changes the world is currently experiencing. Research has shown that the absence of efficient and right ICT development policies in most African countries including Cameroon has widened the information gap between the developed and the less developed countries (United Nations Development Programme report (UNDP), 2001; Kozma, McGhee, Quellmalz, Zallas, 2004). ICT is regarded as a powerful tool in Cameroon that can help improve productivity, competitiveness, stimulating growth, creating employment opportunities and as such enhance the wellbeing of the Cameroonians (Ndongfack, 2010).

The United Nations Educational, Scientific and Cultural Organization (UNESCO), created and used the "One Laptop Per Child" (OLPC) initiative as a means of closing the digital divide gap between developed and developing nations on the use of ICT. Though this action has dominated the front pages of many international organisations and countries as the top education agenda, the actual implementation and practice of this "One laptop per child" initiative have not yielded significant results especially in less developed countries (Ames, 2010). Nevertheless, the development of ICT policies in Africa and Cameroon in particularly have often strives to match international ICT education policy. Despite the massive investment in the integration of ICT in many secondary schools, the practical use of this ICT tools by teachers remain in a preliminary stage with little significant in the educational outcome (Howie, 2010).

The introduction of computer science as a subject in Cameroonian schools has been a focus on equipping teachers and students with the technological knowledge to use ICT (Ndonfack, 2010), resulting in an improper use of ICT in the education domain (Cuban, 2001). Integrating ICT properly in the teaching and learning process education from the Cameroonian perspective is still in the

introductory stage, making this necessary to find out how ICT is used as a tool to facilitate the teaching and learning process. Some teachers still actively resist the use of modern technology in teaching their students. They are more comfortable with the traditional instructional method of teaching and see no relevance of the use of ICT (Ndibalema, 2014). Already, curricula are starting to emphasise capabilities and concerned more about how ICT can be utilised rather than on what ICT is. Numerous studies have found that ICTs by their very nature are tools that encourage and support independent learning (Cuban 2001; Grimes & Warschauer, 2010; Lowther, Inan, Ross, & Strahl, 2012; Warschauer, 2008). ICT in education can enhance learning environment for learners, act as a powerful tool to supplement teachers classroom instructions, use as an administrative tool for teachers and administrators, increase access to education and inclusive education in schools (Jhuree, 2005, p. 469)

According to my little experience as a teacher, I have always had a kin interest in the integration and use of ICT in my country. As an economics teacher, I understand and see the importance of ICT in teaching; consequently, I tried using ICT in teaching in some critical and practical lessons in economics. After teaching my students the concepts of demand and supply which is one of the broadest and the most complex topics in ordinary-level economics, I had the opportunity of showing them some videos of various ways big companies in the country react to demand of their goods. As a result, it did not only facilitate my teaching as I had to use less time to cover my lessons, but it also creates a constructivist environment where students were able to pinpoint for themselves from the video the various relationships of the concepts. So from that time on, I saw ICT learning as one of the best methods in teaching students now when we live in a technology-based society. Also, following the introduction of computer sciences as a subject in Cameroonian school's curriculum also motivated me to venture into this study. After examining computer Integration Across the Curriculum (CIAC) in a large urban minority secondary school in the United States Gibson, et al. (2014) concluded that increasing implementation of computers in schools does not ensure effective use of the tools by teachers to

improve student outcome. As a result, teachers were using computers to prepare lessons rather than for direct instructional use (Cuban, 2001).

The purpose of this study is to explore the scope and nature of the pedagogic use of ICT in Cameroonian secondary schools, the impact of the use of ICT as a pedagogical tool and the role school principals and parents play in enhancing the use of ICT in the pedagogy. Since the implementation of ICT in Cameroonian schools, there remains a huge gap in the integration of ICT in the classrooms. There have been few studies in this field of ICT in Cameroon, and most of the studies have focused on the implementation of ICT. Since the implementation ICT in Cameroonian schools, there have not been few studies that explore how teachers use these tools in transmitting knowledge to the students and the impact that the use of ICT has brought to schools.

There is still limited knowledge about the various ways teachers incorporate ICT as a pedagogic tool in the teaching and learning process, coupled with the role leadership of the principals and parents in influencing the use of ICT in school in the world as a whole and Africa in particular. This study is unique in its kind as it is one of the few comprehensive qualitative kinds research in the field of ICT education in Cameroon. Since the implementation of computers, learning software and the Internet in schools, so many campaigns to convince teachers to use ICT in teaching has come up. This has pushed some teachers from non-users to occasional users and from casual users to serious users (Cuban, 2001). Despite this shift, a huge number of teachers are still non-users, especially in developing countries.

In finding out how ICT is used in Cameroonian school, this study will be guided by three central research questions. Teachers are the essential component in the learning environment and therefore the impact of ICT on teachers, and the strategies they employ to facilitate its usage is critical (Moyle, 2006; Tondeur, Cooper & Newhouse, 2010). The first research question will focus on finding out how these ICT tools available in Cameroonian schools are being used in the teaching and learning process. Next to this the study is going to locate the impact of ICT as a pedagogic tool. Finally, this study is closely

related to the role the school administration plays in enhancing the use of ICT in the teaching outcome and leads us to our third research question. In this study, the school administration will be represented by the principals and the parents. In the Cameroonian context, the school leadership is made up of the principal, followed by the vice principal, the school discipline masters respectively. Consequently, the principal act as the backbone of the school leadership as hierarchical leadership is the leading practice in Cameroonian schools. The principal has big role in facilitating the policies put in place at the ministerial level. Also, parents are regarded important in Cameroonian education context with their partnership with local schools through Parents Teachers Association (PTA) thus, classified under the administration in this study.

The study was carried out in two secondary schools in the Southwest Region of Cameroon. The Bilingual nature of the institutions deeply profoundly the country educational system and was suited it for this study. Also, these schools were selected base on the easy access to carry out data and also based on the fact that they were among the first schools to start experiencing ICT implementation. This qualitative study consists of both semi-structured interviews and observations of a total of 20 teachers. For a more different response, two groups of teachers were purposefully selected. Considering this criterion 10 teachers of range 1-10 years studied in this research as young teachers and other 10 teachers of working age ranging from 11-30 years regarded as experienced teachers were selected for the study. Two principals from both schools as they are the head of the administrative unit and the two parents who are chairman of the parents' teachers' association (PTA) representing parents were interviewed to answer the third research question. For a more diverse response, two groups of teachers were purposefully selected.

2 THEORETICAL FRAMEWORK AND KEY CONCEPTS

2.1 Introduction

The importance of ICT can be traced back in the early 19th century by Skinner a behaviourist and an American psychologist whose view have profoundly influenced the development of educational software. According to Skinner (1938), people can learn more efficiently if their environment is carefully controlled. He developed the principle of operant (behaviour) conditioning which stated that: "If the occurrence of an operant is followed by the presentation of a reinforcing stimulus, the strength is increased" (Skinner, 1938, p.21). This provides the simple tactic of reinforcing the correct behaviour through reward and no action being taken for a wrong act which led to the introduction of computers as a teaching tool (Skinner, 1958). Skinner's paper on "teaching Machine" has a strong approach in designing instructional learning by the teacher. Bullard (2003) criticised the behaviourist theory for focusing more on the teacher impacting knowledge to the student, seeing the student as a receiver of knowledge. He states that:

> "Curriculum needs to be rescued from traditional behaviourist approach domination and cognitive-constructivist approach should be introduced to the system, which is today internationally accepted and fast growing model in education systems" (Usun, 2009, p. 334).

According to Bullard (2003) a proponent constructivist view learning as a process in which individuals construct meaning basing on prior knowledge and experiences. Bullard (2003) in his attempt to evaluate future teachers in training college assumed that it is significant to experience constructivist learning to

develop positive beliefs about the constructive approach. Constructivist view the learner as an active participant involved in structuring their learning experience as opposed to the behaviourist view. Bullard (2003) believes that applying constructivist principles in the teaching and learning process will generate a new way of teaching with computers, constituting a shift from a teacher-centered to learner-centered pedagogy. Agyei and Voogt (2010) added that using ICT constructively will increase critical thinking for learners, encourages small group activities as well encouraging cooperation between students and teachers. Voogt (2010) highlighted that ICT enhances integrative learning through the transformation of theories into practice. Bullard (2003) in his attempt to evaluate future teachers in training college assumed it is significant to experience constructivist learning to develop positive beliefs about the constructive approach.

2.2 Pedagogic Use of ICT in a Classroom

2.2.1 Shulman´s Pedagogic Content Knowledge (PCK)

During the mid-1980s, Shulman (1986) asserts that teachers must possess knowledge about the content area of their discipline. Mishra and Koelher (2006, p.63) added that the cost of not having a comprehensive content knowledge could be prohibitive as students can receive incorrect information and develop misconception in the subject area. Shulman (1986) further elucidated that teachers needed a firm grasp of the analogies and also the frameworks that can be used to explain these facts and concepts naming it the *content knowledge* (CK). Added to this, teachers have to be guided by procedures that should be used within this particular discipline or subject content area. He explains that teachers needed knowledge about how to teach known as *pedagogical knowledge* (PK). Pedagogical knowledge includes planning, and implementation strategies establish in the classrooms such as; grouping students to promote learning from each other, setting up class routines, using discipline techniques and teaching

strategies to enhance learning in the classroom environment. Shulman (1986) stated that teaching is ineffective in a case where the teacher lacks knowledge related to teaching strategies which involve teaching approaches and classroom management. According to Shulman's model, it is believed that when a teacher can connect the content knowledge with the pedagogic knowledge that is appropriate for teaching that content blending them together, results in the *pedagogic content knowledge* (PCK). This represents the original domain of the teacher knowledge (Shulman, 1986; Mishra & koelher, 2006, 2009; Angeli & Valanides, 2013; Graham, 2011; Becker 2014). In other words, the PCK informs the teachers' decisions about the best method to use for teaching specific contents standards to their students. Here, effective teaching will only take place when the teacher compliments the content knowledge with the pedagogic knowledge. For this to happen, when a teacher has a real mastery of the subject together with a transparent delivery method then teaching is effective. Blending this knowledge together enables teachers to make the connection between the content the wish to teach and the best way to deliver lessons in their daily classroom practices (Shulman, 1986).

2.2.2 TPACK Model (Technological Pedagogical Content Knowledge)

Shulman´s PCK model was later developed by Mishra and Koelher (2006) whereby, this time, the infusion of technology into the society had become so prevalent that was almost ubiquitous. Because students are now able to use ICT tools on daily basis, therefore influences the way some specific subjects are taught and also the content knowledge itself (Voogt, Fisser, Pareja Roblin, Tondeur, Van Braak, 2013; Jonassen, Wilson & Peck 2000). The integration of technology into learning has added complexity to the fundamental knowledge of what constitute the teachers' professional knowledge base (Mishra & Koelher, 2006).

The *Technological knowledge* (TK) consists of having an understanding of the standard technologies such as books and chalk and more advanced technologies such as the internet and software. This includes knowledge of ICT

operating systems and the ability to use computer hardware and software (Agyei & Voogt, 2012; Graham 2011; Mishra & Koelher, 2006). Mishra and Koehler (2006) argued that with regards to a more rapid and technological world we now find ourselves in, technological knowledge needs to be included in addition to the content and pedagogical knowledge for the teaching and learning process to be effective. According to Mishra & Koehler (2006), effective pedagogical use of ICT is profoundly influenced by the content domain to which they are situated. They describe technological and content knowledge as *Technological Content Knowledge* (TCK). They added that teachers now need to have knowledge about the technology tools that are part of the discipline content area. TCK focuses on the tools for the content area being able to re-purpose other contents.

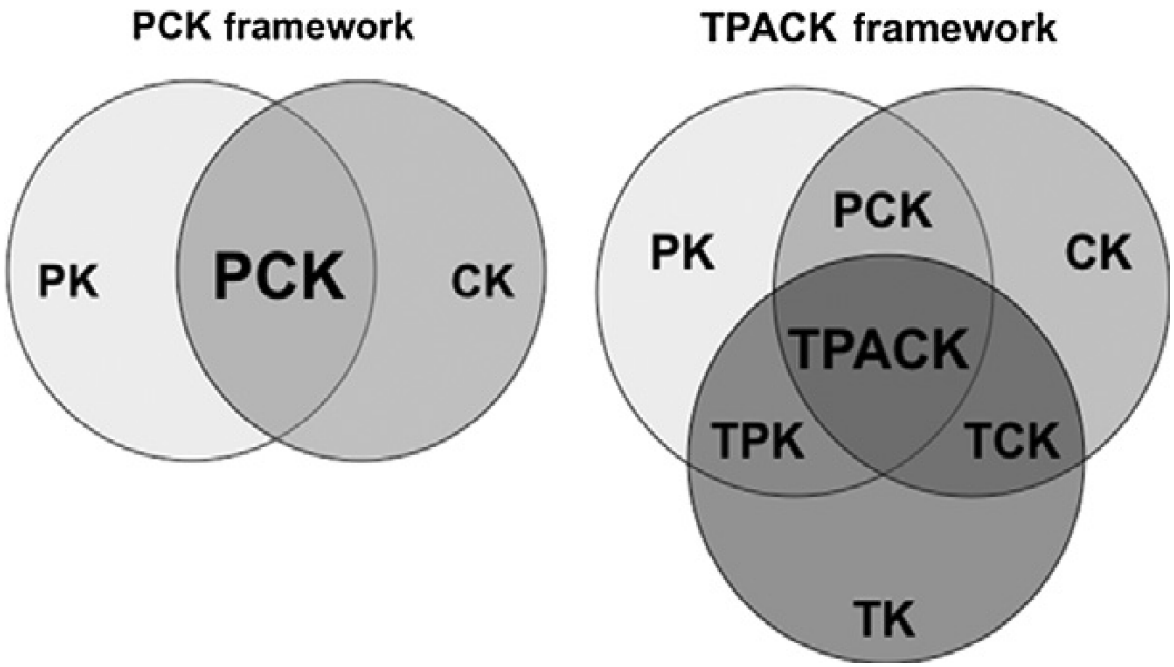

Figure 1 Relationship between PCK and TPACK model

Accordingly, effective teaching is influenced by the way teachers use ICT tools in the teaching and the learning process and not only how they tools functions (Mishra & Koelher, 2006). The overlap with the technological knowledge and the pedagogical knowledge is termed *Technological Pedagogical Knowledge* (TPK) (Mishra & Koelher, 2006) which involves how a teacher uses

technological tools in teaching, selecting the best tools to use when working to make their instructional practices more successful. Graham (2011) added that TPK knowledge begins to develop when the teacher starts to understand the dynamic relationship between the content and pedagogical knowledge. According to Tondeur, Van Braak, Sang, Voogt, Fisser, and Ottenbreit-Leftwich (2012) teachers' TPK remains the most critical area for novice and pre-service teachers because they have not participated in many learning experiences that were enriched by technology. Agyei and Voogt (2012) also argued that teachers need knowledge of how lessons have been planned or designed to integrate ICT into their classroom activities. This type of knowledge (TPK) include strategies and techniques for planning lessons where technical skills are taught as well as the pacing of lessons (Mishra & Koehler, 2006). Also constructing tutorials that support students' use of ICT tools during instruction becomes an important teaching skill.

Setting up the equipment correctly influences how the teacher uses ICT tools in the teaching and the learning process. When a teacher is able to blend the selection of appropriate tools (TCK) with the appropriate strategies and activities to teach ICT enhanced lessons (TPK), it results to the *Technology Pedagogical Content Knowledge* (TPCK) or (TPACK). This is also known as teacher´s knowledge about teaching using ICT (Graham, 2011; Mishra and Koelher, 2006). Mishra & Koelher (2006) insisted that when teachers are equipped with sufficient *technological knowledge, technological content knowledge, technological pedagogical knowledge*, TPACK will be developed thereby enhancing effective teaching with ICT. Angeli & Valanides (2013) further added that TPACK also stands for the idea that what teachers knows about effective teaching, their subject matter and educational technology must be used together for them to be successful in their classrooms supporting students learning.

It is evident from various studies that actively using ICT tools does not build TPK, TCK and TPACK (Mishra & Koelher, 2008; Graham, 2011; Voogt & Tondeur, 2015). For teachers to develop their TPACK, they have to focus on their learning experiences not by mastering them, but by getting themselves

acquainted with a variety of tools that is appropriate for their teaching (Mishra & Koelher, 2006). They asserted that teachers need to be exposed to a repertoire of activity tasks that can be used in a lesson plan and how to appropriately use them in their lessons for effective teaching and learning to take place.

Mishra and Koelher (2006) firmly believed that TPACK is a useful model that have the ability to negotiate the interplay of technology, pedagogy, and content making learning more efficient and effective and more engaging. They added that TPACK develops when the teacher begins to understand the dynamic relationship between CK, PK and TK as well as the knowledge between TPK, TCK and PCK. Good educational technology use is built on the principles of good teaching. In an attempt to examine design-based approaches for ICT integration in African education Voogt and Tondeur (2015) concluded that using ICT to teach is situational. For it to be effective, teachers must be flexible enough to develop knowledge about the school, the students, and the environment they find themselves in coupled with the infrastructure and tools at their disposal. Jonassen, Peck and Wilson (1999) argued that 21st-century teachers have to start creating innovative classroom practices where students are stimulated to engage in active knowledge construction. Mishra and Koehler (2006) added that this call for an open-ended learning environment where teachers are equipped with a combination Shulman´s PCK and TPACK. This is rather contrary to learning environments which focus on the mere transmission of knowledge.

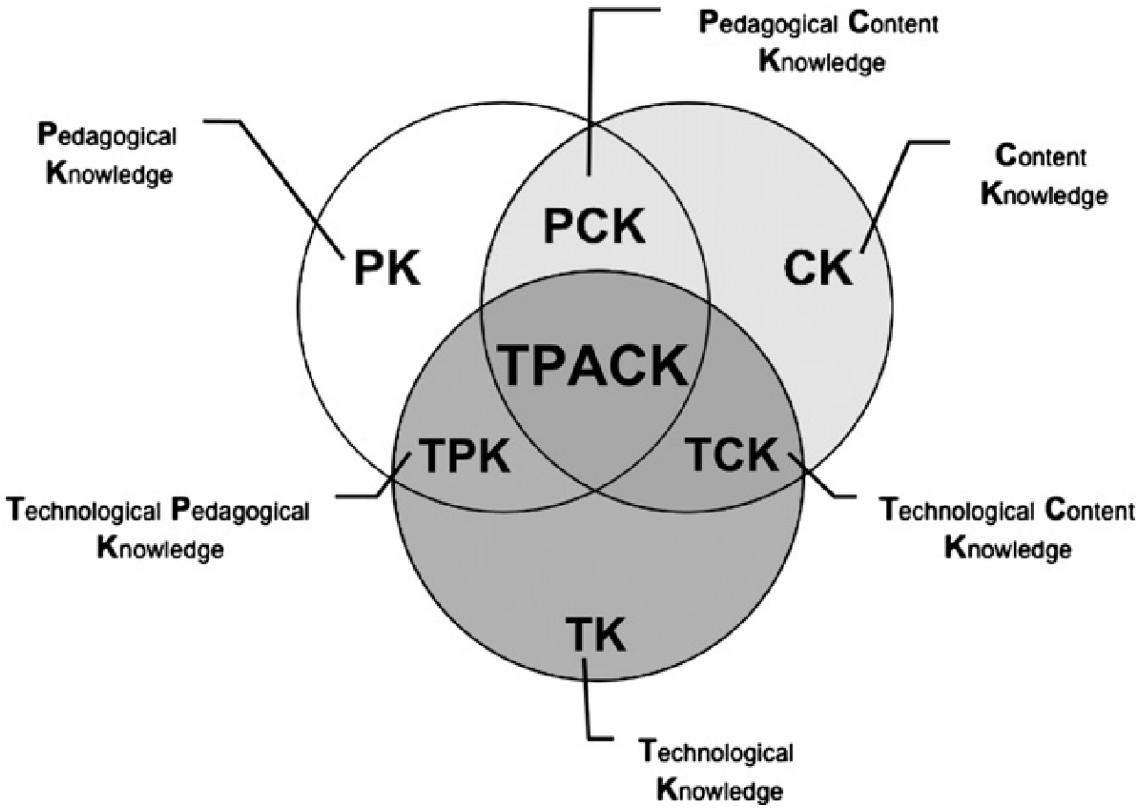

Figure 2 Components of Technological Pedagogic Content Knowledge

The review of the TPACK programme was followed by Voogt, Fisser, Pareja Roblin, Tondeur, van Braak (2013) meta-analytic study of teachers' pedagogical content knowledge of 55 related articles and books between 2005 and 2011. The purpose of the survey was to examine the pedagogical techniques which determine the teacher's choice of using ICT in their classroom. After a review of the analysis, it became evident that the pedagogical techniques that subject teachers often used for example inspiring students (coaching) and creating and environment which enhances constructivist teaching often determined the teacher's choice of integrating ICT with the help of *pedagogical content knowledge*. Also after a review of the TPACK framework, it was observed that there is a relationship between technological and teacher-related pedagogical beliefs. Following this statement, Voogt Voogt, Fisser, Pareja Roblin, Tondeur, and van Braak (2013) continue by stating that beliefs about a particular ICT tool influence the teacher's decision to use ICT in

teaching. In supporting teachers to develop their TPACK knowledge to foster effective teaching in the 21st century, active involvement in ICT incorporated courses were found as the primary strategy.

2.2.3 Teacher Professional Development in ICT and Competency

Agyei and Voogt (2012) carried out a study to evaluate in-service training programmes in Ghanaian secondary schools. Mathematics teachers were trained using a collaborative design approach to develop their TPACK for effective teaching. This study was belt from the TPACK model prepared by Mishra & Koehler (2006), finding out how Ghanaian mathematics teachers use TPACK in their classrooms for effective teaching. Data from this study was analysed using a mixed method. After an in-service training offered to the teachers on how they can use Spreadsheet Supporting Learning (SSL) in solving mathematics problems, a pilot study was then carried out, examining the various ways teachers were using this technological content knowledge to teach their students. Results from this study indicated that after the pre-service programme, teachers were able to combine the TCK and TPK in their lessons. Teachers were able to use the knowledge they were taught about spreadsheet coupled with the various ways spreadsheet can be used to design a lesson to teach mathematics. Consequently, increase in instructional knowledge to teach mathematics using ICT was recorded from all the teachers who took part in the study. Furthermore, collaborative design approach which allowed the teachers to share ideas and knowledge had an impact on their TPACK as it improves communication on the relevant information relating to the best method to use in teaching mathematics using ICT (Agyei & Voogt, 2012). Collaborative practices employed by the teachers promoted a better understanding of what ICT integration in classrooms is all about thereby enhancing the pedagogical use of ICT. Agyei & Voogt (2012) further suggest some guidelines for teachers to develop a more competent approach to integrating ICT in the classrooms. These design guidelines include;

- Creating collaborative design teams where teachers can work with peers to formulate ICT lessons and solve ICT related problems they are faced with on a daily basis;
- Creating an exemplary ICT curriculum materials for teachers, to inspire them to learn;
- Orientation programs which may be in the form of in-service training and other professional development program have to be put in place to prepare teachers by training them with both theoretical, pedagogical coupled with the specific technological knowledge in their subject area;
- Putting in place a user-friendly technology for easy adaptation for the students for teachers to quickly design student-centered pedagogical activities hence creating a scenario where teachers easily integrate ICT into their typical traditional classroom practices (Agyei & Voogt, 2012, pp.561-562)

One of the main shortcomings faced by teachers in integrating ICT in their classroom was the time allocated for the various lessons (Agyei & Voogt, 2012; Cuban 2001; Voogt & Tondeur, 2015). Though the TPACK framework has been appraised as the basis for effective teaching using ICT, Graham (2011) criticise this model on the basis that, it fails to take into consideration the teachers beliefs and values about teaching which are important factors to consider when teaching and learning outcome is concern.

Cuban (2001, p.183) emphasise that for ICT to be actively implemented in classrooms, the policy makers have a significant role to play and these functions include;

- Administrators and decision makers must first understand teachers' strength and weaknesses in classroom work and engage teachers in making provision, designing and implementing ICT plans in the school.

- The structural arrangement of the daily class timetable has to change, giving more time for the teacher to plan his class activities. Also, different kinds of learning should be welcome in the school.
- Technical support and professional development should be made available for teachers to help them in integrating ICT in their classrooms

According to Kennewell, Parkinson, and Tanner (2000), in any society, as far as school is a concern, the primary purpose is to educate pupils to meet the expectation of their community, their parents, and the national government. Kennewell, Parkinson and Tanner (2000) review points out that for a school to successful develop ICT capability the various aspects have to be observed.

- Students must be trained to have an attitude of planning, describing, applying and evaluating their tasks with the help of ICT.
- A healthy school ICT culture in teaching and learning has to be cultivated with dominant use of ICT in the school for teachers and students to develop skills in applying ICT in their various tasks.
- The teachers can develop their students ICT skills by purposefully assigning them with ICT related tasks.

Kennewell, Parkinson, and Tanner (2000) concluded that the higher the level of ICT capability for the students and the teachers, the more potential for the application of ICT in teaching. Voogt (2010) added that the frequency of ICT usage has a positive correlation with 21st- century pedagogical learning orientation. Teachers who use computers both formally and informally are more innovative in the classroom practices than those that don't use ICT at all.

Carlson and Gaido (2002) insisted that the process of investing in ICT tools and resources without adequately financing teacher professional development as well will lead to a wasteful scenario as teachers will not be able to use these instruments and resources in the way they were intended. Carlson and Gaido (2002, p.119) further highlighted that ICT is not, and will never be, transformative on its own as it requires teachers who can incorporate it use into

the curriculum to improve their teaching and student learning. According to Carlson and Gaido (2002, pp. 119-112) review, traditional one-time teacher training workshops which include knowledge in basic operating systems, word processing, spreadsheets has served as an obstacle towards the effective pedagogical use of ICT. They further replace the traditional training workshops which have been appraised by many educational policy makers all over the world as a practical approach in teacher professional development programmes to a new and more sophisticated three-dimensional approach which focuses on lifelong preparedness and development of teachers. These dimensions include;

- Initial pre-service training for teachers that equip them with foundational *technological knowledge, technological content knowledge and technological pedagogical knowledge*. These will help preservice teachers in their competency and proficiency in using a variety of ICT tools effectively.
- Seminars, workshops, and continuous in-service training that offer opportunities for the acquisition of new technological skills in using ICT in the teaching and the learning process.
- Active ongoing pedagogic and technical support for teachers as they address their daily challenges in the pedagogic use of ICT (Carlson and Gaido, 2002 p. 119)

Carlson and Gaido (2002) concluded that ICT and teacher professional development is the best address in a context where the educational reform embraces a shift from a teacher-centered, lecture-based instruction towards interactive, students-centered and constructivist learning. More concretely, teachers' professional training in the use of ICT needs to combine presentations as well as small-group discussion, individual as well collaborative activities, and creating opportunities for teachers to reflect on their actual use of ICT in the teaching process (Carlson & Gaido, 2002). Voogt (2010) added that additional motivation and incentives to participate in professional development practices especially in the incorporation of ICT in the teaching and learning

process should act as a major requirement especially for teachers who are reluctant to change their teaching styles.

2.2.4 Collaborative Use of ICT in the Pedagogy

Previous studies have proven that it is always difficult for teachers to provide timely support to students using ICT in a classroom because of their limited ICT capacities (Kennewell, Parkinson & Tanner 2000; Chigona & Chigona, 2010; UNESCO, 2002; Zhao & Cziko, 2001). Robertson, Webb & Fluck (2007) elaborated that the notion "computer use" can be well explained if ICT is not only seen as a single user activity as the teachers' working knowledge is limited to their current usage. They further asserted that for ICT to be used effectively in the learning process, the ICT tools have to be seen as a shared resource leading to collaborative activities, hence increasing the working knowledge of the teacher and improve the teaching and learning process (Voogt & Tondeur, 2015). Robertson, Webb & Fluck (2007, p. 68) enlisted four major successful collaborative practices for effective usage of ICT in a school.

- Clarifying shared purpose and related practices.
- Improving access to resource.
- Using shared experience to develop and refine teaching and the learning process.
- Enhancing the teacher working knowledge available through in-service training with the ICT tools.

A collaborative school culture increases the likelihood of incorporating ICT into the classroom, students become familiar with collaborative practices, and common shared purposes become the norm as students become well informed when ICT is used in the classroom (Cuban, 2001; Graham, 20011; Voogt, 2010; Tondeur & Voogt, 2015). The actions are more natural in ICT classrooms, and it creates an opportunity for students to have ready and increase access of knowledge through collaborative classroom practices (Robertson, Webb & Fluck, 2007). Robertson, Webb, Fluck and Robertson (2007) concluded that for a school to successfully incorporate the use of ICT, teachers

and students have to collaborate with each other to bring sufficient knowledge. Schools also need to work with other (network) schools, colleagues, families and the community as this will enable new practices to be developed.

Studies have shown that youths acquire ICT skills faster than adults, and they are more likely to share these skills with their peers either intentionally or through interaction (World Youth Report, 2003). Tondeur and Voogt (2010) insisted that instead of teachers seeing this aspect as a thread, teachers can learn how to use ICT from technological savvy students. This can be realised when collaborative, constructivist, and authentic learning strategies are employed in the classroom (Carlson & Gaido, 2002).

3 IMPACT OF THE PEDAGOGIC USE OF ICT

3.1 The World Links programme

In an attempt to prepare the youths to enter and participate in the global economy, the World Links Programme was created with the aim that technology could be used as a vital tool in improving the educational outcomes and reduces the digital divide between the developed and the developing countries (Kozma, McGhee, Quellmalz & Zalles, 2004). The World Link Programme was first initiated in the 1990s with the primary intention of training teachers and supporting schools in the provision of ICT tools to strengthen the integration of ICT into teaching especially in developing countries. This programme has played a vital role in increasing the pedagogic use of ICT in some African countries like Uganda, South Africa, Ghana, Mauritania, Senegal, Mozambique and Zimbabwe (Kozma, McGhee, Quellmalz & Zalles, 2004). After the introduction of this programme, a three-year assessment of the World Link research on the Programme with the use of multiple sources (administrators, technology coordinators, teachers, and students) within an evaluative period 1999 and 2000 was conducted. After surveying both using and non-using computer teachers in world link schools and non-world link schools, the results were outstanding as teachers in world-links schools benefited from infrastructural, ICT tools and resources.

When asked how this tool has helped them in their teaching, many teachers confirmed receiving relevant training in some teaching software and in using the Internet. Findings from this study indicated that when technological infrastructure is developed, followed by training programmes for teachers on how to use these ICT tools pedagogically in their classrooms, developing countries can achieve significant educational changes (Kozma, McGhee,

Quellmalz & Zalles, 2004). Following from this study, the problems teachers in developing countries faced in using ICT were lack time for computer activities and also the lack of national ICT policy. In most of the schools, there were well-equipped computer rooms, but most of the time it was usually empty as the curriculum did not indicate any use of the computer in teaching. Jones (2003) further emphasises that classroom usage of ICT in the teaching and learning process will solely depend on integrating ICT into the formal curriculum and also in testing programmes.

Kozma, McGhee, Quellmalz, and Zallas (2004) initiated a research program also followed by the World Links Development to evaluate three-year plan ICT integration in schools. The world link training approach used in this study was to provide teachers with pedagogical knowledge to integrate ICT into their lessons and support students learning through advanced technological instructional skills. Research findings indicated that the implementation of this programme provided an effective outcome in the classrooms and school participation (Kozma, McGhee, Quellmalz, & Zallas, 2004). Flexibility in using space and technology gives room for a more interactive learning than a traditional standard method where teachers are limited to a particular area (King, Joy, Foss, Sinclair, & Sitthiworachart, 2014).

A meta-ethnographic study was carried out by Tondeur and others, (2012), to examine the different strategies through which pre-service teachers are prepared to integrate technologies into their lessons to identify effective strategies to improve learning. Results from Tondeur and others, (2012) studies suggested that one of the main reasons why teachers are not prepared enough to teach an ICT class is because of their insufficiency of ICT knowledge. Furthermore, for pedagogical practices to improve, pre-service teachers have to be prepared for effective technological integration.

Fisher, Higgins, and Loveless, (2006) carried out a study to find out the impact of ICT implementation after a project known as Multimedia Portable for Teachers Pilot (MPTP) was conducted by the University of Nottingham School of Education 1998. A total of 1150 teachers in 575 primary and secondary

schools in the United Kingdom took part. During the project, teachers were trained with ICT skills on manipulating their school computers and also how to pedagogically use the Internet in the teaching and learning process. The main aim of the programme was to increase teachers' confidence and competence in using ICT pedagogically. According to Fisher, Higgins, and Loveless, (2006) studies, after the MPTP project, 98% of teachers who participated in the project made effective use of ICT in the teaching and the learning process. Self-confidence and competence increase remarkably as teachers were able to use ICT in their classroom with little or no problems. Therefore, they noted that the MPTP program was hugely successful as many teachers confirmed the positive changes ICT have made in their profession.

Furthermore, Hu and McGrath, (2012) study reports on the implementation of the national reform in Chinese secondary schools the objectives of which were to improve the learning of English through the use of ICT. An emphasis on the study by Hu & McGrath (2011) was the focus on the use of ICT in teaching the English language. Reports from Hu and McGrath (2012) research indicated that majority of the teachers have a positive attitude towards ICT and many were happy with the current ICT use in English teaching and the national college English reform. Results from Hu and McGrath (2012) also identified significant percentages of teachers finding difficulties in changing from the traditional pedagogical method of teaching to a technological based pedagogy. Hu and McGrath (2012) suggested that teachers' attitude can be motivated positively by engaging them with continuous professional development programmes that can equip them with new ICT skills.

Though it is assumed that computers support teaching-learning processes and the use of ICT has suddenly emerged, the concept of ICT in the curriculum is still very new and this term poorly understood. According to United Nations global "Education For All" global reports EFA (2002) with the theme "is the world on track?" teachers should have the following competencies:

- Understanding why, when, where, and how ICT tools will contribute to learning objectives; and choosing from among a wide range of ICT tools those that are most appropriate to stimulate students' learning:
- Choosing ICT tools and teaching methods that integrate ICT into the whole curriculum;
- Choosing and recommending ICT tools and teaching methods appropriate to individual students' learning objectives;
- Emphasising the quality of what students produce and the contribution to personal learning goals and levels of attainment;
- Planning a whole learning programme that allows a range of ICT tools and teaching methods to be used, as and when required;
- Choosing tools and teaching methods that allow the teacher and student to manage their learning

The EFA initiative has recognised that ICTs have a great potential for knowledge dissemination, effective teaching and development of efficient education policies (IICD 2007, p. 18)

3.1.1 The International Institute for Communication and Development (IICD)

The International Institute for Communication and Development (IICD) project was created with the aim of enhancing the use of ICT in education in developing countries. According to the IICD (2007), ICT can improve quality education when teacher educational content is fully developed when ICT has been supported and used in the administrative process in the school. To support this project, different educational projects which cover areas such as teacher training, development of teaching materials and school administration from the primary to the tertiary sector were carried out in some developing countries. Also, the IICD worked with these governments to develop their ICT educational policies. The IICD (2007) educational project focuses on integrating

ICT from a traditional perspective (radio, television) to modern approach (email, Internet). The aim of most of the projects is not just to supplement the traditional instructional method of teaching with ICT but integrate ICT in a much more advanced way in the teaching process.

Data from the IICD-supported projects showed an overwhelming impact on the teachers and students as they were the most active participants who benefited from these initiatives. After four years of the project implementation, it was discovered that awareness and empowerment on the use of ICT had a considerable high score amongst the students and teachers. Also ICT training courses in this project offered help over 80% of participants to use ICT in their education. Many confessed that materials and services provided by the projects enable them to learn through practice how to use computer, CD or DVD in the teaching and learning process as opposed to the didactic method of instruction. The participants also recognised a positive impact on quality education as a result of the provision of ICT facilities, developing the content and curricula.

Furthermore, the various projects clearly showed that the many ICT projects carried out to integrate ICT in these schools in developing countries have made a positive impact towards the education for all (EFA) universal goals for education access. Teachers and students indicated that the biggest obstacle for effective teaching through ICT in education was the lack of sufficient access to ICT facilities. To solve the problem of access to ICT, high-cost ICT resources like the Internet was replaced at times with alternative modes such as CD-ROMS were great teaching software and materials were stored and used during the educational process.

This study also highlighted the fact that for a school to use ICT in the teaching and learning processes, some strategical involvement between the school and parents are necessary to ensure sustainability of the ICT facilities. Results of the IICD project suggested that a contribution made by the parents-teachers association was vital in supporting ICT projects, especially in developing countries.

A review by Villanueva-Mansilla and Olivera, (2012) on the impact on the "One Laptop Per Child" (OLPC) initiative in Peruvian schools proved that although practically the OLC campaign has been successfully implemented in many schools, there are still significant problems associated with the actual use of computer by the students and teachers. Using ICT in non-computer oriented classes has been a big hindrance in ICT integration (Villanueva-Mansilla, & Oliviera, (2012). This follows from the view that learning to use the computer is a goal in itself but the incorporation of ICT in the teaching and learning process still poses difficulties. Most teachers and principals who are still reluctant in using ICT as a pedagogic tool in the classrooms and schools are likely to base their arguments on their inexperience in managing the utilisation of these tools, potential damages and mostly likely the students' lack of attention (Mansilla & Oliviera, 2012). This study contradicts Zhao and Cziko (2001) review of the perceptual control theory perspective of teachers' adoption of technology. They examined the effective method of smooth integration of ICT in the classroom emphasising that effective use of ICT in the teaching process play a vital role. Zhao and Cziko (2001) stated that ICT incorporation in a classroom would not act as a hindrance in learning through disturbance or distraction. When teachers cultivate a self-belief about ICT as an effective pedagogical tool, they will have control over the ICT.

To support the impact the pedagogical use of ICT in teaching and learning, Li (2007) carried out a study to monitor the Integration of Computer Across the Curriculum (ICAC) programmes. This programme was introduced in a large urban minority school district in the United States with the aim of developing new ways of using technology in planning lessons by teachers. After the introduction of this program, a two-year intervention study was carried out to examine the teachers´ ICT use, the impact of utilisation and anxiety on the student learning outcome. Li (2007) found that students whose teachers participated in the higher intervention study of ICAC demonstrated increase and effectiveness in ICT usage and their attitudes towards ICT as a learning tool was positive. On the other hand, teachers who participated

minimally in the study did not have the ability to integrate the use of ICT. Li (2007) concluded that student own environment and resources at home and school have a big part to play in their attitude and use of ICT in learning.

Ilomarki, Lakkala and Lehtinen (2004) (2004, p. 54) insisted that successful professional development of teachers focuses on particular classroom application of general pedagogical ideas, exposing teachers to actual practice, create opportunities for group support and collaborative practices and involves careful evaluation and feedback. They asserted that if computers are going to have a significant impact on the teaching and learning process, it has to be integrated into the curriculum, not just as a separate subject but as a tool that can support the learning of other disciplines stemming from science and mathematics to social studies and creative arts. To bring this change, both in-service and pre-service programmes need to be effectively organised for teachers to be equipped with required skills needed to incorporate ICT in their classrooms.

3.2 Problems Associated with Pedagogic Use of ICT

Studies in Sub-Saharan Africa, South America and Some European countries have shown enormous efforts put in place by governments and other international organisations in the procurement of ICT tools and establishment of infrastructures. Recently, the incorporation of ICT in the teaching and learning processes is still a major problem faced by teachers (Voogt & Tondeur, 2015; Mansilla & Olivera, 2012 Agyei & Voogt, 2012; Kozma, McGhee, Quellmalz, & Zallas 2004; Ajayi. 2008). Still, the teaching approach commonly used by teachers in secondary schools is the talk and chalk approach where the teacher do most of the talking and pedagogic work while the student is regarded as passive recipients of information (Agyei & Voogt 2012; Voogt & Tondeur 2015). This problem can be traced from teacher training programs which have a significant impact on teacher use of ICT in teaching (Mishra and

Koelher, 2006). Agyei and Voogt (2012) stated that teachers in many countries are offered just basic ICT courses at the pre-service training to prepare them on how they can integrate ICT in their various classrooms concerning their subject discipline. As a result, this has placed so many doubts whether pre-service teachers are prepared for the new teaching method which focuses on student-centered learning, teacher flexibility and the use of ICT. After examining pre-service training programmes in Norway, Almas and Krumsvik (2008) concluded that despite the long-lasting focus progressivism in Norwegian education, teachers have continued to reproduce an existing pattern of schooling based on teacher-centered approach and interaction where teachers decide in most part what to do coupled with when and how to do it. They insisted that the low use of ICT in Norwegian schools and subject can no longer be attributed to the lack of ICT tools or accessibility, but the lack of digitally competent teachers who can integrate ICT in their day to day classroom practices. Nkwenti (2010) concluded from his review of in-service ICT programmes for Cameroonian teachers that only 1.2 percent of teachers had undergone on-the-job ICT training on the practical use of ICT and more than 60 percent of the training skills acquired to use ICT in pedagogy are theoretically driven.

A study by Cuban (2001) in Silicon Valley higher secondary schools in the United States of America shows that it is quite fascinating that policy makers and curriculum planners implementing ICT in schools are still to make changes in the standard school timetable utilised by teachers. In practice, on a daily basis secondary schools' subjects are divided into periods with each lasting from forty-five to an hour depending on the curriculum documents. This always makes it difficult for teachers to engage in innovative classroom practices in integrating ICT in their classroom because of the limited time they have with the students (Agyei & Voogt, 2011b; Agyei & Voogt, 2012; Cuban, 2001). Consequently, the school structure and curriculum act as a significant barrier to ICT use as a pedagogic tool in classrooms.

From the 19th century, the use of chalkboard, pen and pencils has proven from so many surveys as the most popular and reliable mode of instruction (Shulman, 1986; Cuban, 2001). This has affected teachers in this 21st -century thinking as they now see ICT in teaching as an "add-on rather than a pedagogic tool in classroom teaching" (Cuban 2001 p. 164). Cuban further explains that the multiple uses of computers in upgrading software, word processing programmes, backing up files, PowerPoint presentations added to the connection failures and sometimes booting problems impede teachers' confidence from the benefits of its practical use. Cuban (2001) further observed that the problem teachers are faced with integrating ICT in their classroom are a mismatch of software. He explained that most of the software applications used in schools like spreadsheets and databases were created for a business purpose and not for education. Another typical example would be YouTube, Facebook and Twitter that were set with the intention of video sharing, photos and status updates. Though many teachers started using this software in teaching, initially they were not meant for this purpose and so it remains difficult for teachers to use this software in the teaching and learning process (Cuban, 2001; Pelgrum, 2001; Agyei & Voogt, 2015). Many teachers do not have competence in using this software as their primary aim was not created for teaching purposes (Cuban, 2001)

After substantial worldwide implementation ICT in schools, studies have found out that those teachers who are more proficient in using ICT focus on the internet search and word processing instead of project-based teaching (Graham 2011; Cuban, 2001; Agyei & Voogt, 2012; Li, 2007). In another word Cuban (2001) firmly affirms that technically, the use of new technology amends the way teachers usually do. He continues by demonstrating in his study carried out in Silicon Valley secondary schools that the majority of the teachers who were considered ICT competent used computers for grade recording, administrative purposes, communication with parents and other colleagues, and research practices. This in effect is not encouraging for policy makers and those that advocate for computer usage in schools.

A qualitative study was carried by Chigona and Chigona (2010) to examine the level of ICT adoption amongst educators in the Western region of South Africa after a project aimed at introducing technologies to schools, at the same time equipping teachers with ICT skills. This project was launched in 2001 with the primary goal to ensure that by the beginning of 2012, every teacher would be entitled to use ICT in delivering their lesson properly. From a review by Chigona and Chigona (2010), for the use of ICT in classrooms to realise full impact in the teaching and the learning process, it will require from the educators to take advantage of new capabilities and approach to pedagogy which can only be experienced through the effective use of ICT. The capability approach which was the main conceptual frameworks regarded as what educators are effectively able to do; taking into account the resources that are made available for them. From this study, the concept of capability was defined as a process where with a good knowledge and skills of ICT, an educator will be able to incorporate ICT into his/her teaching whenever necessary thereby making good use of the ICT tools and resource available. After nine years of implementation of this project in disadvantaged schools in the Western region of the country, a qualitative study was carried out to evaluate teachers' capabilities of the use they are making from these ICT facilities that were put in place. Data was collected using a qualitative study which was based on face-to-face interview 14 teachers and two ICT personnel and observation of participants who were randomly picked from four disadvantaged high schools in the West of South Africa.

Results from Chigona and Chigona (2010) analyses reveal that there was capability deprivation of educators to use ICT in delivering their lessons effectively. There was an insufficient integration of ICT in these schools as a result of personal, social and environmental factors. Beginning with the individual factors, most of the teachers had just basic ICT skills and so they had difficulties in integrating ICT in their pedagogy. In other words, their technological knowledge (TK) did not match with their subject content knowledge (CK) and so they didn't have enough confidence to make use of the

ICT tools and resources at their disposal. Though the ICT tools and resources were made available to the school which is a valuable resource for the learning and teaching process, very few teachers made use of these ICT tools in their teaching. Thus, it appears that the project put in place to improve the teachers ICT skills through training was not useful since many teachers were not confident enough to use ICT in their classrooms. As concern the social factor, the policy put in place to the utilisation of the computer labs did not give the teachers access to computer labs. Teachers complained that the timetable did not warrant them to make use of the school's computer labs. As to the environmental factors, it was observed that schools did not have adequate equipment to support the integration of ICT into all subjects. Also about the environmental factor, analyses show that those teachers who had knowledge and right to use computers in their teaching complained that they received limited ICT support which negatively affected their use of ICT in teaching.

Most of these factors that influence the use of ICT pedagogically are solely dependent on the context, such as organisational setup of the school. Kozma, McGhee, Quellmalz, and Zalles (2004) evaluation of the World Link program of ICT in the curriculum and education confirms that many countries do not have a clear goal on the implementation of ICT. Education in many countries is still largely based on behaviourism making it difficult for teachers to enjoy the full impacts from the use of these tools in their classroom.

Despite the massive investment in the integration of ICT in secondary schools, still the effective and efficient pedagogical use of these tools has come to a big challenge (Pelgrum, 2001; Ndibalema, 2014). Focusing on the learner outcome in the use of these tools, De Witte Haelermans, and Rogge, (2015) carried out a learner outcome research of the utilisation of ICT using the Trend in Mathematics and Science Study (TIMSS) in 2011. A series of mathematical tests were run with two control groups of students with a classroom that had a shortage in ICT and the other classroom that has not experienced a shortage in ICT. Results demonstrated that students with teachers who do not experience ICT shortage had a higher test average of 544 in mathematics while students

who teachers experience ICT shortage had an average test score of 540 in mathematics. De Witte, Haelermans, and Rogge, (2015) concluded from their study that school factors like student population, and school management play a vital role towards teachers' use of ICT in teaching mathematics.

3.3 ICT Enhancement by School Administration

3.3.1 School Principals as Technological Leaders

According to Flanagan and Jacobsen (2003), schools administrators all over the world are now faced with a new responsibility as technological leaders. As a result, they need to develop new competencies to handle this new role effectively. Adu and Olatundum (2013) added that as technology flows faster in the schools, many school leaders tend to face a range of difficult management issues. A major challenge faced by principals have been to support teachers as they explore and experiment with diverse ways to integrate ICT in meaningful, challenging and authentic ways across the curriculum (Flanagan and Jacobsen 2003, p. 126). One overlooked problem faced by many educational systems in the world today is the effect of the school principals' leadership on the pedagogic use of ICT in the teaching and learning process (Holland, 2000; Yee, 2000; Schiller, 2002; Fullan, 2006; Hargreaves 1994). More so, Wang (2010, p.52) further concluded from her study carried out in Taiwanese schools on the role played by principals in enhancing the use of ICT that the lack of high school leadership act as a major obstacle to effective pedagogic use of ICT. According to Schiller (2002, p. 294) some principals are still dormant and hold the notion that ICT is still in an introductory stage of development in the teaching and learning process. As a result Schiller concluded that majority of teachers are using ICT to extend traditional classroom practices, only a few of them are using ICT for student problem solving or tasks that integrate ICT across traditional subject boundaries.

Flanagan and Jacobsen (2003) argued that one of the barriers to ICT integration is the inadequate professional development of the teachers. They

insisted that teachers have limited access to appropriate ongoing professional development and even if teachers have the opportunity to enrol and participate in a typical in-service training programme, they end up acquiring just technological knowledge (TK) rather than technological integration strategies (TPK) and project skills. As a result, they urge school principals to provide responsive and flexible professional development opportunities to teachers that focus on equipping teachers with TPK rather than TC and TCK (Flanagan & Jacobsen, 2003, p. 127). They identified five common elements that can also be translated as aims for the school principal as technology leaders to enhance the use of ICT in the school. The principal have responsibilities as;

- A Leader of learning; demonstrating a thorough understanding of the ICT programmes by communicating, inquiring, decision making and problem-solving.
- A Leader of student entitlement; addresses significant issues of equity of access to technology to all students and teachers.
- A Leader of capacity building; acting as an active change agent by working with teachers, monitoring the development of a vision for the pedagogical use of ICT in the school and acting as a mentor or coach to teachers.
- A Leader of the community; involving the community, including parents, other non-governmental organisation and business partners in achieving the goal of the effective pedagogical use of ICT in the school. The principal also communicates the successes and challenges to the community and create networks that extend students learning beyond the walls of the school.
- A Leader of resource management; responsible for managing the resources for the effective pedagogical use of ICT in the school. This also includes fundamental decisions such as the location of computers in computer labs or classroom, developing guidelines for the purchase of hardware and software, and wiring (Flanagan and Jacobsen, 2003, pp. 132-140)

Furthermore, a qualitative study was carried by Yee (2000) exploring the experiences of 10 principals in selected ICT-enriched schools in the Canada, United States and New Zealand. This study described the support principal's offers to teachers and students to acquire skills and knowledge in the pedagogical use of ICT. In an attempt to enhance the use of ICT in the pedagogy, the principals were regarded as technology leaders as they organised their leadership practices in eight different categories (Yee, 2000, p. 291). Evidently, all five primary responsibilities enlisted by Flanagan and Jacobsen (2003) of a technology school leader were present in the principal's leadership practices in Yee (2000) study. Yee (2000, p. 292) further urge principals to take on the role of transformational leadership characterised by charisma, individualised consideration, inspiration, intellectual stimulation which was predominantly present in these school principals practices to enhanced ICT practices in the pedagogy. Practically the ten principals in these ICT-enriched schools suggested that for a school to become an ICT-enriched one, the school principals should be ready to incorporate the various practices in their schools.

- Creating shared leadership style will help school principals to manage their workload and will enforce teachers and other stakeholders' commitment to developing a vision for ICT in the pedagogy.
- Deploying ICT tools in easy-access, high-use areas in the school such as classroom, libraries and hallways.
- Creating collaborative practices where ICT staff support teachers through need-based professional development programmes.
- Networking with credible organizations outside of the school to provide additional sources of ICT equipment and expertise.
- Becoming an ICT learner along with other teachers and students.
- The principal can create a network of people such as; teachers, students, parents ICT technicians and also non-academic staff in the school who can help find answers to ICT question.

Salleh and Laxman (2014b) carried out a study in Brunei (Australia), primary schools to examine strategies adopted by the school leaders to promote the use of ICT in learning and how these strategies are related to teachers´ awareness to use ICT in their classroom practices pedagogically. It was evident from the study that principals envisage strategic planning and ICT goals as key policy blueprints in incorporating ICT in the teaching and learning process (Salleh & Laxman, 2014b, p. 354). It was also interesting to note that majority of the principals confirmed the use of ICT in the teaching process as a requirement for all teachers in their schools. Consequently, since many teachers held the belief that using ICT was a need in the schools; a majority of them were actively using ICT in their pedagogic activities. More so, Salleh and Laxmann (2014b) suggested that in enhancing the use of ICT in the school, principals can;

- Play a role as a motivator who encourages teachers to use ICT.
- Give moral support to sustain teachers' use of ICT in teaching.
- Facilitate or necessitate teachers' use of ICT in teaching thereby acting as an enforcer (Salleh & Laxmann, 2014b, p.357)

Wang (2010, p.53) added that no matter how dedicated and persuaded teachers maybe about the benefits of the use of ICT in pedagogy, they will not achieve much if they are not supported both financially and morally from their principals. McGarr and Kearney (2009, p. 87) regarded principals as key pedagogic leaders and as such their views, and the thought process about ICT have a significant bearing on the extent to which ICT will become embedded in the pedagogy. Schiller (2002, p. 290) added that through school principals' key role as architect and communicator of vision in the teaching and learning process they can enhance the use of ICT in the pedagogy either by action or inaction by directing school budgets and professional development practices for teachers. After examining Australian principals' intervention in enhancing the use of ICT in the pedagogy, Schiller (2002) concluded that when the school principals took the role of an initiator or manager through the provision of ICT infrastructure, more likely, the incorporation of ICT in the teaching and

learning process was more successful. These training supports were in the form of organising regular ICT workshops, one-one practice session, peer tutoring, team teaching and hiring of technological leaders to their schools (Schiller 2002, p. 297).

Nkwenti (2010) insisted that majority school principals are faced with more leadership difficulties than ever on the basis that they do not undergo any professional ICT training to lead schools where ICT facilities are available. Consequently, this also acts as a significant barrier to the integrate ICT in the pedagogy as there is no access to professional training for school principals. Carlson and Gaido (2002, p. 124) further recommend school principals to participate in introductory professional development in the pedagogic use of ICT. As a result of this, they will stand a far more likely to encourage teachers to use ICT in the teaching and learning process. After examining the integration of ICT in United Kingdom schools, the British Educational Communication and Technology Agency research (Becta 2007b, p.14) strongly recommended that courses on strategic leadership in ICT should be made available for school principals to enhance the pedagogical use of ICT.

3.3.2 Parents Involvement and Support in the Pedagogic Use of ICT

One of the greatest boosters of ICT in school systems are the parents as they want their children to prosper; hence their engagement in their children's education has a significant and positive impact on learning (Becta, 2007). Generating parents support for ICT is vital in schools where the use of ICT in the pedagogy is to be sustained or expanded (Carlson & Gaido, 2002). According to Kozma, McGhee, Quellmalz, and Zalles (2004) Evaluation of the World Link programmes, more than 20 developing countries primary source of continuous financing of ICT in schools are provided by the parents. For example, parents are supporting the implementation and sustainability of ICT tools through fundraising events organise by schools. With their children as the direct beneficiaries of technology-enhanced learning, parents in developing countries are forced to financially support and sustain the use of ICT at the

school level making them a vital stakeholder in the enhancement of ICT in schools (Becta, 2007). Becta (2003b) suggested that offering training ICT training to parents will enable them to understand the potential it has for their children. As a result, such training will empower parents to bear a portion of the financial burden, enabling their children to take advantages of these new opportunities (Carlson & Gaido, 2002). Tondeaur and others (2012) agreed that one of the ways schools become learning communities is when trained parents in the use of ICT become monitors or aides in school computers labs as this encourages school-community integration, providing opportunities for students and adults to share their skills and knowledge with one another.

Furthermore, home access through ICT to school information brings parents more closely into contact with the school, thereby encouraging them to feel that they also have a role to play in their children's education (Becta, 2003b). Wellington (2004) concluded that access to shared ICT School data by parents leads to a close relationship with other parents.

Kerawalla and Crook (2002) asserted that the main reasons why the majority of households are interesting in owning a home computer are due to educational use by their children. Although parents are heavily investing in their children's education by equipping them with ICT tools at home, it is evident that students spend more time in non-academic use of these tools such as playing games, email chat and instant messaging (Kerawalla & Crook, 2002; Livingston & Bovill, 2001). As a result, research suggests that there is a gulf between parents' aspiration and the children actual domestic practices of the use of ICT (Becta, 2003b). A review of by Kerawalla and Crook (2004) of parental engagement in their children's use of ICT at home suggested that parents were attentive to their children computing activities but complained that they could not actively engage in these activities as the medium did not promote educational use of the tools. They further concluded that ICT use at home by students are poorly incorporated as parents perceived that their children are more engage in ICT activities that derailed them from their academic work. Kerawalla and Crook (2002) finding shows that even though

parents are now encouraged to invest more in their children's education through the provision of ICT facilities at home, there is little evidence to proof that students are using these tools academically. Given the open, uncensored and unchecked nature of the large bulk of information in the internet, Willington (2001) explained that much of the information students' encounter at home when browsing the internet maybe educationally inaccurate and morally dubious. In an attempt to enhance the pedagogic use of ICT, Becta (2007b) suggested that as parents are making provision for ICT tools at home, they should also be ready to monitor and disciplined their children to use the instruments for an educational purpose. Hollinworth, Mansaray Allen and Rose (2011, p.353) insisted that for proper pedagogical enhancement of ICT by parents, there should exist a form of restrictions and parental lockouts on home computers so the students can only access certain sites that they have allowed.

4 RESEARCH METHODOLOGY

4.1 BACKGROUND OF STUDY

Cameroon as of 2004 has an estimated total population of about 20 million people with a surface area of 475,442 km (Epah & Amin, 2007). It is bounded to the west by Nigeria, northeast by Chad, to the east by the Central African Republic to the South by Equatorial Guinea, Gabon and Congo. Cameroon is a bilingual country with French and English as the official Languages. The two official languages came into the Cameroonian scene in 1916 when Britain and France partitioned Cameroon into two unequal parts after defeating the German Forces in the country during the Second World War. These new colonial masters then imposed their languages in the area of education and administration.

Formal education in Cameroon is run by five ministries; Ministry of Basic Education (from nursery to primary), the Ministry of Secondary Education (from lower secondary to higher secondary), the Ministry of Higher Education (universities and higher professional institutions), the Ministry of Technical and Vocational Training and the Ministry of sports and Physical Education (in charge of all youths sporting activities in the country) (African Economic Outlook, 2014). At the national level, these ministries develop the education policies and ensure the implementation of these policies at the regional, divisional, and sub-divisional levels. At the secondary level of education, tuition at government schools are subsidised which means parents are charged to pay only registration fee for their children. In addition to this, parents are expected to work in collaboration with the schools through the Parents Teachers Association (PTA), providing helping hands to major school projects. Consequently, they are regarded as a principal source of finance for running the schools.

Students at the secondary school level specialise in the art or science fields. The English speaking students study for five years, at the end of which

they are expected to take the General Certificate of Education examination (G.C.E) at the Ordinary Level (O/L). The French speaking students are scheduled to study for four years before taking a national exam which leads to "Brevet d`Etudes du Premier Cycle du Second Degree". Further specialisation is made at the higher secondary school level with two years of studies. Students are expected to take G.C.E Advanced Level (A/L) examination for the English speaking students and "Baccalaureat" for the French-speaking students after three years of studies.

Cameroon occupies a vital position in central Africa with regards to its quality human resources, a wide variety of cultural assets, infrastructural assets and its geographical location (which provides access to the sea for several counties), and political stability (World Bank, 2012a). However, the penetration and usage of ICT by its citizens is relatively small (NAICT, 2007). The president of Cameroon has always strongly emphasised that the active emergence of a Technological informed society in the country will "strengthen unity between Cameroonians…" and, thus, "make the country better placed to enter the third millennium". The president has always invited Cameroonians to adopt and use ICT in their daily lives' activities in an attempt to combat poverty (Ndongfack, 2007).

To comprehensively create a national ICT development plan, the Cameroonian government created a National Agency for Information and Communication Technologies (NAICT) in 2002 by Decree No. 2002/92 of 8 April 2002 (NAICT, 2007). This agency was set up to monitor government actions in the area of information and communication technology. As part of this initiative, the Cameroonian government inaugurated the first multimedia resource centre at Lycée Général Leclerc in Yaounde in November 2001 which serves as a major improvement towards ICT development in the country. According to the NAICT (2007) policy report, the formal education system does not have a comprehensive framework for adequate ICT training in Cameroon, and the majority of school leavers received just basic or no training in ICT

resulting in less than 5% of Cameroonian university student who is ICT capable (NAICT, 2007).

4.2 Research Methods

This study is a qualitative case study of two Cameroonian secondary schools. Qualitative research has been defined as a research approach in understanding an individual or group attributes to a social or human problem (Cresswell 2014, p.32). Qualitative research involves a process of surfacing questions, and procedures for the collection of data in the participant's context. From a constructive view, Cresswell (2014, p.48) asserts that the participants` views are sought by the researcher to establish the phenomenon. This is different from the transformative standpoint as the researcher in this approach aims to examine a particular issue related to the oppression of individuals. Qualitative research is useful when the concept or phenomenon needs to be explored in cases where fewer studies have been done in the area. Consequently, qualitative approach is required in a contemporary study as this, especially when the phenomenon has never been addressed with a certain sample or group of people and is marked by the following characteristics;

Qualitative research is conducted at the site where the participants experience the problem or issue under investigation. Here, the participants are not taken into a confined lab. Data is collected through conversation in the form of an interview, discussion and observation of the participants' behaviour as they act to the phenomenon within their context.

The researcher acts as a research instrument for collecting data from interviewing participants, observing their behaviours and examining relevant documents that relate to the phenomenon under study.

Multiple sources of data are collected using qualitative research, such as interview, observation, documents and audiovisual information rather than to rely on one data source.

In the entire qualitative research, the researcher focuses on learning the meaning the participants understand the phenomenon and not the meaning the researcher bring or the writer's knowledge of the literature.

Qualitative research design is flexible and emergent in nature. This implies that initial plans for research and the whole process are viable to changes after the researcher has started collecting data in the field. (Cresswell, 2014)

More so, a qualitative case study is defined as an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between Phenomenon and context are not clearly evident (Yin 2002 & Cresswell, 2014). The case study examines the phenomenon in perspective so that the findings generate insights into how the phenomenon occurs with a given situation (Creswell, 2008). Cresswell (2008) highlighted that the essential tactic that characterises a case study is the collection of data from multiple participants by using different data sources. He further emphasises that the research methods are strengthened as evidence is triangulated. An investigation of various perspectives provides a sound basis for the findings and supports arguments for the contribution to knowledge. Therefore, a case study is used in this study as it provides an in-depth exploration of the pedagogical use of ICT in Cameroonian secondary school. This study focuses on two Cameroonian secondary schools to examine the research problem through interviews and observations with the teachers, principals and parents.

4.3 The Participants and the Research Process

The sample in this research includes teachers, principals and parents. In selecting participants for the study, purposeful sampling technique was introduced. Purposeful sampling involves a sample of participants that are thoughtfully recruited to understand the research questions thoroughly (Yin, 2002). Consequently, certain individuals were chosen based on their particular

pedagogic positions in their schools. This study was carried out in the English region of Cameroon; specifically, the South West Region, and was limited to two public secondary schools. This is because these schools were the first to adopt ICT pedagogy in this region. The choice of the English region is because English is used as the language of instruction and easy communication access between the researcher and participants. More so, there has not been much research in these schools since the implementation of ICT by the government.

In an attempt to answer the central research questions a semi- structured interview with open-ended questions was used as it allowed the researcher to gain deeper insights into participants' opinion (Yin, 2002; Cresswell, 2008; Cresswell, 2014). Three groups of participants were selected making a total of 24 individuals. The first research question focused on exploring the use of ICT in the teaching and learning process. A total of 20 subject teachers were selected to answer this question through interview and participant observation on the practicality of ICT tools. Following the use of ICT as a pedagogic tool, a second research question was developed which focused on explaining the impact of ICT on pedagogy as seen through the teaching and school leadership lens. The last research question focused on the school administrators and parents' role in enhancing the use of ICT in the pedagogy. The two principals of both schools were interviewed to find out their role in enhancing the use of ICT in their schools. Also, the two PTA heads were also interviewed to get the response from parental view on strengthening the use of ICT in the two schools.

Table 1 Summary of Research Instruments, Methods and Participants

Research Questions	Data Collection Instruments	Participants
How do teachers use ICT as pedagogic tool in the teaching and learning process?	Semi-structured interviews Pictures Observation	Teachers

What is the Impact of the use of ICT on pedagogy?	Semi-structured interviews	Teachers and principals
What role do the school administrators play in enhancing the use of ICT?	Semi-structured interviews	Principals, parents

Structured scheduling instruments were used to collect data. Data collection methods used was semi-structured interviews defined by Lund (2012) as verbal interchange where one person (the interviewer) elicits information from another person (the interviewee) through series of questions. The interview was regarded as one of the most appropriate data collection method in this study based on the assumption that the theoretical framework and research questions could be represented through the description of specific inferences and positions (Lund, 2012). The purpose of the interview was to allow the researcher to collect descriptive data from the participant's perspective and also gain insight into how the participant understands and interprets the phenomenon under study. For the sake of reliability; participant observation study was carried out. Instruments for data collection in this research were audio tape recorders, to record the interview conversation between the researcher and the participants and also a digital camera to capture some moments that relate to the phenomenon under study.

Interview duration with teachers was between 15-20 minutes while interviews with parents and principals lasted for 25-30 minutes. The principals and parents interviews were longer than that of the teachers to get more in-depth information on the phenomenon and also because the study was limited only to two principals and two parents representatives from the schools. The interviews were conducted in the schools ICT multimedia halls because it was a convenient site for the participants and also for practical reflection of the

phenomenon by the teachers. The principals were interviewed in their offices early in the morning before they started their administrative duties. One of the parents was interviewed in the school while the other parent was interviewed in his house which was not far from the school.

Progressively educational systems around the world are predominantly more focused on presenting ideas in the form of political and pedagogical dogma, rather than presentation and understanding of practice in schools (Haugland, 2005). As a result, our knowledge about the situation in schools becomes inadequate. Therefore, interviewing the various stakeholders (teachers, principals and parents) involved is a preferred strategy for obtaining information about their thinking and for understanding their school environment. These interviews permitted the researcher to capture the perspectives of pedagogic use of ICT in the teaching and learning process, its pedagogic impact and the role played by the principals and parents in enhancing the use of ICT in these schools.

Field notes are regarded as one of the primary data in qualitative research (Cresswell, 2008). Notes taken in the field are meant to provide details about the researcher's reflection of the phenomenon, the people, events and places. During the face-to-face interviews in this study, the researcher was able to observe not only the verbal data but also non-verbal as well. Non-physical expressions were collected and interpreted as another data source, forming the observational data. Also, pictures of the various sites related to the phenomenon were taken. The field notes were classified under observational data collected following the Schatzman and Strauss (1973) categorisation of notes on the ground.

4.4 Ethical Consideration

A research ethics describes the various actions carried out by the researcher in a study. Ethical rules in a study according to Cresswell (2014) contain two main areas, such as; research requirements and individual protection requirements.

Individual participants and the society as a whole have the right to demand that the research conducted is of high quality and ensure that phenomenon studied is properly verified. Also, participant protection which consists of confidentiality, consent, information and utilisation requirements are vital throughout the study.

During this study, a research permit request was sent to the principals of the various secondary schools four weeks before the actual data collection. Written on the research permit was an application to collect data from the different institutions, the purpose of the study and the various participants who are going to take part in the study. Before the instruments were presented to the participants, the significance of the study was clearly communicated to each participant. Participants were informed that the study was strictly for academic purpose and the data was going to be treated with a high degree of confidentiality. All the teachers interviewed were assigned codes from T1 to Tn during the analysis to strengthen anonymity in the research. Participants were also informed that all quotes mentioned in the study are going to be anonymous and not directed towards any information that would reveal their identity, for example, name or place of work. Extra time was given to each participant for clarifications about the phenomenon under study before the interview started. Participants were also given the option to accept participation or refuse.

4.5 Method of Analysis

Krippendorff (2013 p.127) argued that where the phenomena of interest to analysts are social in nature or when text and images are involved, quantitative measurement has serious shortcomings that only competent human can overcome. Qualitative analysis demands a high level of creativity to categories meaningful data to address the research problem from large data sources (Cresswell 2014). In this study, all interviews were recorded using an audio tape recorder and transcribed. Also, field notes were taken by the researcher to

form the basis for the observation study. For the sake of familiarity and precision of the data, the transcripts were checked and re-checked for easy inductive analysis.

Using the interview as the primary foundation for data collection, teachers, principals and parents comments were analysed for themes and patterns. The differences and similarities in perspective were traced. All the audio-taped interviews were chunked into units of discourse, and an open-coding was conducted. Participants' quotes were used as example and evidence of the findings. Also, pictures were used to analyse observational data whereby moments related to the phenomenon under study were captured and described to strengthen the findings. Literature was used to analyse and discuss the themes that emerged. Gaps between the literature and findings were identified.

5 RESULTS

This chapter consists of the analysis of data carried out during this study. The data was collected through 24 interviews and seven school days of

participant observation. To adequately express the teachers', principals', and parents' original thoughts, direct quotes and synthesised stories were used to show objectivity of the research. The objective of this chapter is to demonstrate the real-life practice of ICT in Cameroonian schools, its impact in the teaching and the learning process and the role school administrators (principals and parents) plays in enhanced ICT in the pedagogy.

5.1 How do teachers use ICT as a pedagogical tool?

This section explores the different pedagogic practices of ICT in the teaching and the learning process. This chapter will explain how teachers in both schools use ICT in their classroom, the kind of skills and competent teachers they have, and the various ICT tools and infrastructures these schools possesses.

5.1.1 Teachers' Pedagogic Use of ICT

Understanding how teachers use the different ICT tools in the teaching and learning process will portray a broad picture of the usage of ICT in Cameroonian schools. In an attempt to answer the question, various dimensions were analysed. These different aspects of the pedagogical use of ICT in the schools were investigated. While getting responses from the teachers using the interview items coupled with classroom the observations, it is evident that the pedagogic use of the tools in these schools by teachers can be classified into three main types of users. Some of the teachers make use of the available tools in the school during their lessons. Also, other teachers who saw the need for these instruments in the teaching and learning process created their personal initiative in using ICT tools pedagogically in their classrooms making them active users. Furthermore, some teachers were passively involved in using ICT tools pedagogically in the teaching and the learning process as they use the tools to prepare their lessons, assigning students to search for information and research purposes. Further investigation shows that some of the teachers were

non-users of ICT tools as they confirmed they saw no need for using these tools in the teaching and the learning process.

Table 2 Summary of ICT tools Used and Purpose

ICT Tools	Active Use	Passive Use
Projectors	PowerPoint presentation, picture display,	
Laptop, desktop,	video lessons, showing animated videos, lesson presentation,	Research, searching information, finding out better presentation method, lesson preparation,
Google, Google Scholar	Teaching students to find academic materials on the Web.	Searching information, assigning students to search information
Virtual lab software	Showing practical scientific videos	
Phones, Ipad and other mobile devices	Reference in the classroom, showing real images to students	searching information, SMS teaching, research practices
Radio	Teaching through music	

Beginning with teachers who were considered active users of ICT tools in the teaching and learning process, many examples were demonstrated how these teachers use ICT tools in their classrooms. It was evident that most of them started their lessons by explaining the concepts in their various subjects through the use of the traditional instructional approach. Since the classrooms were not equipped with ICT tools, they later took the students to the school multi-media-centre to show them the concept through the use of ICT tools. While some of the teachers made use of the tools provided by the school (by

taking the students to the school multi-media centre), others use their personal initiative to incorporate the ICT tools in their classrooms. This was visible from one teacher's response:

"For example, in my class, usually, before I bring them here at the school multi-media centre, I teach them in theory the various concepts in the subject area, then later bring them here so they can see for themselves the concepts I taught using displayed image on the computer". (T3)

Another teacher who was using his personal initiative in incorporating ICT in his classroom explains that;

"As you can see in my bag is my laptop. I have a lot of videos on laboratory experiments that I use in teaching my subject. I start by explaining the concept to the students since they cannot visualise the process then I play videos on my laptop". (T4)

Many of the teachers who actively use ICT made mention of projectors, one of the teachers explains that:

"Sometimes I prepare my lessons using PowerPoint, putting it into slides and present to my students using overhead projectors". (T12)

Another subject teacher commented:

"Basically after doing the standard traditional instructional teaching in the classroom, I take my laptop to the ICT labs, using the projector to project images, I stand behind the class allowing the students to watch video lesson for some time then, and I pause from time to time to explain". (T10)

The teachers elaborated that considering the context and student-teacher ratio in the school, projectors serve as a tool that can be easily used to help many students at a time. This was clearly explained by one of the teachers as follows:

"The tools are limited around our schools so we use what is available we have a projector, so to project the images so that it can reach a large audience as is the case here". (T11)

One of the teachers talked about a newly strategy he just devises considering the large class size where the teacher pair fast and slow learners to work together collaboratively. He said:

"Usually in my class, the technique I use for this vast class number is that I pair three or sometimes four students to work per computer. I allow the students who have mastery in manipulating the computer to sit directly on the computer while others (slow learners) watch what they do and follow the lessons" (T10)

Teacher (10) also explains how he makes use of his personal laptop in the classroom;

"I use my laptop computer in the classroom, as I have software and scientific videos which I demonstrate to the students when teaching. I have programmes in my portable computer like virtual lab and 4 stroke engine animations".

Other teachers admitted using their phones and Ipads to show real-life images to their students and as reference source when they are teaching their lessons;

"As you can see I have an Apple Ipad here with me, when I get to topics like folding and faulting, or volcanicity I have a real images on my tablet that I use in showing them in the classroom, I try as much as I can to improvise and match my teaching with reality".(T20)

Another teacher said:

"When I'm teaching, I keep my Tablet beside me to verify what I'm teaching and to check from other sources online".T5

A teacher further reiterated that:

"I use my phone too. Sometimes I maybe in a class and a student ask a challenging question or in cases where I need to relate what am teaching to real life situation, I may just use my phone to browse through materials related to the lesson I am teaching". (T9)

Furthermore, from the analysis, the other set of teachers admitted not using the tools directly in the teaching and learning process but in an indirect way that ensures effective teaching. They acknowledged that pedagogic use of ICT may not only be the direct use of the tools in the classroom but also indirect uses of the tools (passive usage) that facilitate the teaching and learning process. Also, all of the teachers confirmed having personal computers but when they were asked what use they make of it, different responses came up. The majority of them responded that they use their computers for research

purposes, communication with colleagues and students, to prepare their lessons, and social purposes. Some commented;

"Whenever am at home, there are advanced mathematics related PDF articles that I usually search through the internet and save on my computer. I usually go through these items at home so as to help me improve my mathematical knowledge. So in most of the cases I use my computer back at home to study. I also use it to prepare evaluation exams". (T2)

Another teacher said;

"So basically I use the ICT tools just for research purposes to compliment my lesson notes. In case I found new materials, I try to add to my lesson notes so that the student and myself are abreast with the information that are changing". (T8)

To continue, it was evident that one of the teachers was actively making use of some mobile applications as a collaborative tool with his student as he explains:

"I use recent mobile applications like Viber and WhatsApp to communicate with the students giving them academic directives in my subject area". (T9)

An additional question was asked why this teacher was using these mobile applications as a pedagogic tool considering from observation that students were not permitted to use mobile devices in class and he responded:

"ICT in the teaching and learning process is a vital issue that must be taken seriously because we have gone past the age where teaching must be done in a classroom, or under a tree. We are now in an age where technology rules, so at least we should try as much as possible in our Cameroonian schools to incorporate ICT in the teaching and learning process." (T9)

Also some teachers assigned students to find information over the internet in their subject area and one teacher described how he teaches his student to find good academic materials online, saying:

"I give them tips to do research on the internet, for example, when I am teaching topic like seismology (study of earthquakes), I usually assigned them after the class that when they go back home, when they are browsing the internet, they can type on the url google.com, from there they can type Seismology in the Google search box".(T7)

Inasmuch as majority of the teachers were considered as both active and passive users of the ICT tools in the teaching and learning process, few teachers

admitted not using the ICT tools pedagogically. From their views, they asserted that ICT in education is still a new concept so it will take time for teachers to start making use of the tools in the teaching and learning process. It was evident that pedagogic use of ICT still posits as a difficult challenge amongst teachers as some of the teachers were more comfortable with the traditional instructional method of teaching. They explain that ICT was inappropriate in their subject area. Appraising the traditional instructional method of chalk and chalkboard, they explained that they saw no need of using ICT in teaching some practical lessons as it demands step by step processes which are more suitable or better understood when the chalk and chalkboard are used. Some of their responses are as follows:

"It has been a good experience so far given that we are using our traditional method of teaching. We live in a country where ICT is still developing, and so I prefer to use the traditional method, the board and chalk and it has been fine". (T19)

"I think physics is more of a practical subject that needs demonstration in certain aspects and is not enough to use ICT tools to teach the subject. In physics you actually have to demonstrate aspects such as solving equations using the chalkboard so students can clearly see the steps. But using ICT tools like projector will not be effective in such lessons". (T1)

From a general point of view, the pedagogic use of ICT in both schools can be considered as very low. Maturity of teachers were passive users and only two teachers created innovative classroom practice with ICT in which they gave the students active role in participating in their learning. In as much as many of the teachers considered the tool vital in the teaching and learning process, it seems the interest in incorporate ICT in pedagogy is still in a surface stage in these schools.

5.1.2 Teacher ICT skills and Competent

In this study, teachers' knowledge of the use of ICT as well as their skills and competencies were investigated. Understanding why some of the teachers were active in using ICT tools in their classrooms and others using it indirectly,

teachers were asked to explain the kind ICT related training in their subject area, they undertook. From their responses, it was clear that most of the teachers have taken just basic ICT training on how to operate ICT tools during pre-service and in-service training. Also, most of the teachers who are making active use of the tools responded that their skills and competency in the utilisation of these tools came as a result of personal efforts they took out of their working hours for their personal development. It was later found that the delegation of secondary education organises seminars on ICT, but it was not compulsory for all teachers to attend. Those teachers that participate explained their frustration in that the in-service training they took did not help them in their subject area explained that the in-service training they received did not help them in their subject area. As a result, many admitted not having enough knowledge to integrate ICT in their subject area. From the general view, it was visible from the various responses that these trainings were focusing more on *Technological knowledge* rather than *Pedagogic Technological Knowledge.* This is evident from some of their comments:

"After my training as a teacher of ICT at the Higher Teacher Training College (Ecole Normal Superieur), seminars are being organised every year by the Regional Delegation of Secondary Education to train teachers of the subject and update them on syllabus changes. These training are specifically for teachers of ICT as a subject. On a general note, other seminars are being organised to train teachers on basic computer skills. But most of the time these trainings do not help teachers in integrating ICT in their subjects". (T10)

Another teacher said:

"First of all, our programme and curriculum do not allow us to use these tools. You know we go for seminars, but I have not yet attended a seminar where we are taught how to integrate ICT in mathematics lessons. Most of the symposium I have attended, teachers were just trained on some basic computer skills". (T2)

Contrarily, other teachers express their satisfaction on the seminars but emphasise that it helps them in improving their technological knowledge and

not knowledge in using the tools to teach their subjects, one of the teachers noted;

I have received in-service training and also equally not long ago under one non-governmental organisation. After all these trainings, I became flexible in browsing and doing research over the net. So I think that training was a key to my current skills on the internet. (T13)

The teachers admitted that the seminars did not help them in their subject areas and so they could not make practical use of the tools in the classrooms even when they got the opportunity use them. Consequently, they admitted not having sufficient knowledge to use ICT tools effectively in their classroom. Some of the teachers who were competent enough to use the tools in the teaching and learning process admitted that most of what they know came as a result of their interest in the ICT tools and the ability to work collaboratively with other ICT competent teachers. One of the teachers noted;

"Most of what I know has been through my personal effort and sometimes I asked help from colleagues who are more ICT competent". (T11)

Another teacher explains:

"I can say most of what I know about ICT comes as a result of the optional courses I took from my university education and also my personal effort because I believe in professional development".T11

Later in the analysis, it was evident that teachers who have spent so many years in the teaching profession gave some unique response of not been train to use this, tools back in their pre-service training. As a result of this they could not use ICT in their classrooms. This was noted from a respond of one of the teachers who has been teaching for 28 years.

"Students are being taught how to use computers. But for us teachers, we did not have that opportunity we were not taught back in our school days how to use these ICT tools. Even in teaching we were not taught how to use it in teaching back when I was in the teacher training college, so you can understand why I don't even use them in my classroom".T15

From the various responses, it was evident that many of the teachers gave reference to previous training and ongoing ICT training offered by the

delegation of secondary education. Overwhelmingly, these training did not equip them with the knowledge needed to use these tools in the teaching and learning process, as a results many of the teachers were not practically using these tools in their classrooms. This serve as one of the variable why pedagogic use of ICT tools remains a difficult concept amongst teaching staff. Further investigation was carried out on how these in-service training are conducted, fortunately, one of the participant teachers interviewed was part of the organising committee of the ICT seminars in this region. He gave a different view about workshops organised by the delegation of secondary education.

"These seminars are compulsory for the schools to send teachers with the aim that knowledge gotten from there will enable the teachers to teach the students better using ICT tools. Unfortunate just a handful of teachers are usually interested in attending these seminars. From my experience, it is during these seminars that more materials and techniques are being given to the teachers concerning their various scheme of work". (T17)

Teachers' skills and knowledge would not be of much value to the process of integrating ICT in the teaching and learning process without considering students' skills and knowledge in the pedagogic use of ICT. Following from the interview, teachers were asked if their students have the skills to make effective pedagogic use of ICT. Some of the teachers who were more competent in using these tools in the teaching and learning process express the fact that it was impossible at times to use some of the tools as some of the students did not have enough knowledge about the utilisation of the tools. The teacher admitted that some of the students are coming from the diverse background and consequently limit the utilisation of the tools in their classrooms. The teachers unanimously agreed that:

"The children are coming from different background, some from poor homes where it's hard to for them to have personal computers, I have so many chemistry and physics learning software on my computer but it is impossible to share with them because most of them will not understand how it works". (T10)

Clearly, in this section, it is evident that majority of the teachers admitted that, they did not have enough knowledge to use ICT in their classrooms pedagogically. Though the school and regional delegation was offering free in-service training for teachers in ICT, many of the teachers claimed not being interested in attending these training. Some that attended admitted that these seminars did not help them in any form when it comes to using ICT in the teaching and learning process. Interesting there further investigation saw a contrary explanation about how the in-service are organised by one of the teachers who was a trainer in the in-service training programme. These conflicting views from these teachers will form a firm base for future research in this field as it will be biased to underestimate justification made by this teacher. Since there is no accurate answer how these seminars are organised, it would be interesting if further research is carried out to explore ICT both pre-service and in-service ICT training for Cameroonian teachers. It is also noted that children background affects the pedagogical use of ICT in the classroom.

5.1.3 Access and ICT infrastructure

Evidently, access and the available infrastructures remain the main factors that influence the pedagogical use of ICT in schools. This was not absent in both schools. It was evident from all the responses that the teachers made mention of the aspect of access. While some teachers were given access to the school multi-media centre and ICT tools, others complained of not having similar access to the ICT facilities in the schools. Since computer science is one of the subjects in the curriculum, teachers in this domain are given access to use the multi-media centre of school while other subject teachers admitted not having access to the school multi-media centre. Also, many of the teachers interviewed complained of the lack of ICT tools in the schools. Other made mention of the fact that the classrooms are not well equipped with these tools, so it is difficult to teach using ICT tools. Some of the arguments the teachers put forward were as follows

"In larger classes like Form 2(Grade 7) where I'm supposed to use a projector at all times to ensure effective teaching, it's quite frustrating for me because there's only one projector which is sometimes being used by another teacher in another hall. So in such cases, I'm forced to use the regular traditional method of teaching". (T14)

Another teacher said:

"Considering the fact that our school has computer labs, the labs are just names because the equipment is not worthy; and we have mostly second-hand equipment that is usually difficult to use. Schools like our own supposed to have internet connection throughout, but we have a problem, we can go for a term without internet network, so it makes it difficult to use ICT to be able to teach. (T15)

From the various responses, repeatedly, teachers explained the high level of autocracy in using the school multi-media centre which also acts a difficulty in using ICT tool in the schools. One of the teachers clearly explains from his experience the problem he usually faced in using the ICT room, as his response;

"Only ICT teachers are allowed to use the school labs. For a subject teacher like me, to come here with my students, I need to start first by taking permission from my head of the department in charge of my subject area. The head of the department then asks for permission from the school discipline masters, who make a request to the ICT monitor in charge of the school multi-media centre. You can see the level of bureaucracy in this process". (T17)

Also though many of the teachers use their personal initiative in bringing ICT tools such as their laptop computer, phones and Ipad in classrooms to show display images and play videos in their lessons, they complained of a shortage of electrical adaptors in the class to support their devices while teaching. Amongst the interviewees, all the teachers were not satisfied with the classroom structure. From observation of the classes, both schools have an average of 60 students per class. Concerning to this factor, it was hard to incorporate ICT in such a large class size as many teachers said:

"I have to teach tomorrow from 9.00am till 4.00pm, but my laptop battery can only last for a maximum of five hours. So since there's no electricity supply in the classrooms, I'll not be able to go through my lessons for the day as planned". (T5)

Another teacher bitterly said:

"Poor connections, infrequent electricity supply bring a lot of puddles, the number of students in classrooms, having almost a hundred plus with almost no space for circulation. All of that you know compact the difficulties that go with using ICT usage in the classroom". (T12)

Repeated responses from many of the teachers of unequipped ICT classrooms reveal their loss of interest to incorporate ICT in their classrooms. On the other teachers who had the interest in integrating ICT could not effectively use ICT tools because of poor network and lack of electricity in the classrooms. It can therefore be concluded that integrating ICT in these schools will demand significant classroom arrangements to suit the ICT tools teachers intend to use.

5.2 What is the impact of ICT on pedagogy?

To get a comprehensive picture about the general use of ICT, it was necessary find out the impact ICT have on pedagogy from the teachers and principals. This question was focused on finding teaching and learning outcome ICT have brought in the schools. Teachers openly admitted that ICT is a vital tool in education and practical use of it improve the teaching and the learning process. According to the responses gathered from the teachers, their use of the tools has improved their content and pedagogic knowledge as they can now deliver their lessons without many difficulties as before. Some of the teachers also admitted using ICT has changed their role from an instructor to a guide making the job easier than before. Also, some teachers actively practice collaborative and project-based teaching. Teachers use ICT as a collaborative tool for them and their students for wider comprehension. The different impact of ICT saw teachers improving their content *knowledge, pedagogical knowledge, technological knowledge* and students' achievement.

5.2.1 ICT Facilitates the Teaching Process

Predominantly, the teachers' apparently admitted that their use of ICT had an impact in their subject area. All the teachers make use of the tools in doing

research and improving their knowledge in their subject area. Teachers discussed that using the internet to find materials in their subject domain has exposed them to a wide variety of materials online that have increased their scope of understanding in their various subject areas, thus improving their *content knowledge*. Also, teachers' agreed that the use of ICT to prepare their lessons had facilitated the teaching job as they no longer have to carry heavy textbooks and papers to the classrooms.

One of the teachers highlighted that the internet has helped him both in getting diverse materials in his subject area and reduce the cost of buying textbooks:

"When I am browsing the web, I find much more information that is not available in textbooks because the truth is textbooks are limited when it comes to finance. Through the internet, I can get a diverse source of information without spending much". (T14)

Other teachers unanimously agreed that their use of ICT tools in preparing their lessons and further research in their subject areas had enabled them to become more confident when teaching as they are now exposed diverse form of information:

"Using the internet, I found a whole bulk of information concerning my subjects and in several ways which make it easier for me to understand. Also, I have become more confident in class than before because of the distinct kind of information I got through the internet. Now I prepare my lesson using my personal computer which for me has help in organising my teaching."(T4)

Another teacher said:

"If the computer was not there, I don't know I would have found it tough to pass information to the students. Because when I am preparing my lesson I make sure I visit as many scientific websites as possible to get diverse information about my topic. I don't just focus on textbooks because knowledge there is limited. So ICT makes a difference". (T6)

One of the mathematics teachers who had just started using ICT in his classroom explains that:

"I have found out that mathematics is well taught with the use of ICT tools because mathematics is most challenging subject to most African children, by making it

visual, helps them to understand faster and it also makes the teaching process easier". (T18)

The few teachers who were using tools in the teaching and learning process made mention of the fact that their use of ICT has enabled them to cover their lessons faster than before, some of them explained:

"Take for example I have a printer at home which has helped me so much in my profession. With the limited ICT tools available in school, I have derived a method where I now type my lecture notes, print them and photocopy many copies to share with my students. Now much of my lesson time is allocated to discussions instead of the past years where I had to copy the notes in the chalkboard for the students to copy in their books which usually makes my teaching challenging and time-consuming."(T11)

Another teacher said;

"Using ICT tools facilitates my lessons, for example, a lesson that I used to teach for one hour, now is possible for me to use just 30 minutes. Usually, practical mathematics lesson which involves plotting a graph or drawing tables, a teacher have to come to the classroom and use so much time in drawing and plotting the various points using a chalkboard. What I do in such cases now is that I usually prepare that kind of lessons well ahead of time using Microsoft Excel which is easier, practical and time-saving". (T13)

A contrary view was given by one of teacher who had incorporating ICT but still faces difficulties as a result of insufficient knowledge of the use of the tool in the teaching and learning process as he explains:

"There was a time I try to use my laptop in the class, but I discovered that it was not easy because finally, I could not even finish the work I programmed for that day. I was not familiar with the tools because I have never received any formal training in teaching my subject using these ICT tools". (T6)

Furthermore, some teachers highlighted ICT does not only help him to transmit knowledge to students or to get diverse information in his subject areas but also use ICT actively as a learning tool to develop themselves:

"Through my quest for professional development with the help of ICT, I had the possibility to take free online courses through MOOC (Massive Open Online Courses)

in my subject domain. I usually log in and watch free video lectures on some important topics in geology". (T9)

Responses from the teachers clearly demonstrate that ICT was helpful in one way or another in their teaching profession. While some of the teachers were using the ICT to prepare their lessons, others admitted that ICT had changed their method of lesson delivery.

5.2.2 Impact of Collaborative Use of ICT

Predominantly, in most of the classroom, some teachers were using these tools in the teaching and learning process so as to improve pedagogy, from their words, it was clear that ICT has changed the way they deliver their lessons. Not only are they now saving more time and covering their lessons quicker than before, but also the use of ICT has brought them closer to their students than before as this teacher said:

"I don't talk too much again, the big desire of teacher-centred approach has died in me because more often than not I talk little and the students do the rest. Am there now like a coach, like a monitor on what they are doing."(T12)

Another teacher explains that the students are now able to learn by themselves as a result of incorporating ICT into his teaching:

"It is very easy when you use ICT to teach, you don't talk much, the tool talks for you especially using the virtual lab in teaching chemistry. You just have to tell the students we are in a lab now you can see from the video how Nitric acid is mix with sodium chloride after that some just take down notes on what they are seeing". (T10)

Some of the teachers stated that the tools do not only bring them closer to the students but also ICT act as a collaborative tool between the students and the teachers. The teacher explains that collaborative practices through the use of ICT have enabled them to teach their lessons effectively.

"Now, it is more time saving using ICT in my classroom, and much time is now allocated to discussion instead of the past years where I had to use up all the lesson in copy the notes on the chalkboard for the students to copy in their books".(T11)

Teachers also made mentioned of increase in class participation and discussions:

"I have realised higher classroom participation as I now give out students' opportunities to try out one or two things during my lessons. My job now is to guide them to make sure that they are on track". (T11)

One other teacher said:

"The traditional instructional method of teaching permits all knowledge to flow from the teachers to the students, and the students are known as receivers of knowledge. However, the new system with the use of ICT creates a constructivist approach of learning where the students can do research on their own with little or no help from the teacher the teaching and learning process is more interactive between teacher and student, and better learning outcome is realised". (T4)

As a result of the integration of ICT, many teachers were creating project-based learning through the use of ICT to get their students more involved in learning not only in the classrooms but also at home. One of the teachers had created a blog online where lecture notes are being uploaded in his subject area, and students are all given access to make open comments on the notes. The teacher explains that through this blog, students are now able to learn from each other through the comments. The teacher explains:

"I have even created a blog online, where I upload my lesson notes online for the students to study and make comments before coming to class. The blog is called "Universe physique". Last year, I gave an assignment through this blog, and interestingly I noticed many of the students have visited the blog and made some useful comments which I believe helped other students". (T5)

Another teacher talked about the impact of his SMS project based learning he created:

"What I did the last year 2015 was that I device a personal initiative called SMS teaching and learning, I call it my baby. Using this action, I collected all the mobile phone numbers of my students. Each night before I go to bed, I send a message to each student consisting of past GCE questions of about 3 to 4 years back. I instruct them to read topics related to the questions so we can discuss them in class. Every night each student had a question to sleep over. The following day in class we talk for about 30

minutes on the different how to attempt the questions. Through this initiative, all my students are now able to participate in my lessons actively".T9

Furthermore, through observation of some classroom practices; it was evident that there were collaborative practices as a result of the use of ICT by the students.

Figure 3 A Vignette of Collaborative Classroom practice with the Use of ICT

Figure 3 clearly depicts collaborative practices with the use of ICT as students are found actively working together in the classroom, sharing ideas and learning from each other.

On the other hand, some teachers did not change their role or positions in the classroom as a result were still using the traditional instructional teaching method even though they integrated ICT in their lessons. This was evident from some of the observation made during this study. There were no significant changes in the teachers' position in the classroom.

Figure 4 A Vignette of direct Instructional teaching using ICT

Figure 4 shows a teacher who is competent in using ICT in their classroom but still lack knowledge of the practical use of the ICT tool through collaborative and constructivist learning practices to involve their students more in their lessons. This statement was later strengthened by a teacher who placed more emphasis on the direct instructional use of ICT in the teaching and learning process. This still boils down to the fact that teachers still lack knowledge in effectively integrating ICT in their classrooms.

The teacher said:

"I think ICT are indispensable tools in our society and any teacher who does not use ICT either for direct instructional teaching or research and other academic related purposes is an outdated teacher because knowledge changes every day and is always good to be updated with present knowledge especially teachers". T13

Teacher skills and competency directs their use of ICT. ICT was found as a vital tool that improves the teaching and the learning process as many teachers demonstrated. It is important here to note that being skilful and competent in the use of ICT does cannot ensure its correct utilisation in the classroom.

Teachers start enjoying the benefit and real purpose of the use of ICT when they start to use the ICT tools to get students more involve in the teaching and learning process

5.2.3 The Impact of ICT on students' outcome

To get the impact of ICT usage on students' outcome, the teachers were asked to describe the standard of attainment in their subjects when ICT is used. The majority of teachers admitted that their ICT incorporation has significantly improved the students' outcome as compared to the past years. This was evident from one teacher's response:

"Attainment goals are measured by the student performance, and I can proudly say that last year, if I go by my results we had one of the best results as a government school where we improved from 67% to 84%, so the result alone tells you that there is a lot of improvement". (T12)

Another teacher indicated that teaching through music has considerably improved the attainment level of her students as she explains:

"With teaching through music in my classroom, the standard of attainment in is high, and the class is livelier, the students learn much better especially when this method of teaching is used." (T16)

One of the teachers who just started using ICT few a years ago gave his testimony of the impact ICT had in his subject area:

"Since I started using ICT tools in this school, added to using my phones, laptop and modem at home, I realise that there are significant changes in my teaching and also the student. From the year 2014 that I started using ICT in the teaching and learning process, I realise that the first batch of students I started using these ICT tools with, had 98.6 %pass in my subject area in the GCE examination. Last year we had 100%, to be honest, I cannot do without ICT in my profession". (T9)

Another teacher who has been actively using ICT software and video lectures in his lessons explains:

"My students´ performance has improved a lot because now they can relate what is being taught with the real life scenarios in mathematics as we turn to use some

excellent mathematics software like excel and also play CDs making the teaching and learning process more enjoyable. For example when we look at what I did last year with my students like pure mathematics, the students who performed well were those who have been attending and being attentive to lessons taught using ICT tools"(T18)

Inasmuch as teachers were excited about the impact that ICT has brought in the pedagogy, repeatedly, it was interesting to discover from the teachers that they were afraid that ICT has also served as a distracting tool to the students, making many of the students not to concentrate on the lessons taught. Also considering their economic background, teachers unanimously agreed that some students are so excited when they see these tools been displayed in the classroom and that distract them from lessons. This was typical of a response of one of the teachers.

Using these tools in my classroom I have realised that ICT turns to act as a distracting device to some students. Some students are more interested to see how the instruments are functioning and usually become excited instead of following the lesson.T17

Most of the teachers accepted that they have observed for the past years that students are excited when it comes to ICT tools, which make them not to use it for scholarly purposes. According to their response, students now have phones which could be a great material to do research, but they end up using it for texting, Facebook and many other non-academic purposes which at the end of the day derailed them from their studies. To create a clear and unbiased picture during the study, additional data were collected from the students, finding out how the make use of ICT tools in the school and the impact it has on their academics. In an attempt to collect this data, two focus group discussions were organised cheered by the researcher out consisting of 6 students per group in both schools. These focus group discussions lasted for 30 minutes. From the students' point of view, the use of ICT in the school was not as frequent as they would have liked. As a result, ICT had little impact in their academics. The students complained of stricter rules that make it almost impossible for them to use the school computers. One student even narrated her story of not given

access to use the school computers even when she needs to search for materials to study. When the students were further asked why they are not given access to use these tools, most of them explained that the ICT monitors have always held negative notions about them using the tools. They admitted that the school ICT monitors believed that either they do not use the instruments academically in searching information related to their studies or they cause the computers to mal-functioned. All the students denied these claims and instead insisted that these allegations were just an excuse to refuse them from using the tools. Also issues about phone use during school hours were raised. Students from both groups were not happy at all with the non-use of phones in both schools. It was interesting to note from the students that bringing their phones to school will not affect their academics in any way. Some even suggested that they now have smartphones which could be used to link them and their teachers and also serve as a research tool in during school hours as they spend a good chunk of their time in the school.

From a general point of view, ICT has a significant impact on the teaching and the learning process and many teachers expressed. The teachers claimed that ICT positively affected their teaching. But still, some complained that ICT has instead created more difficulties in their classroom when they try to use the tools. After an investigation, it was found that these teachers did not have good ICT skills. Teachers did not give a specific example of the direct impact of ICT on student performance. Therefore there are still doubts if it was the only ICT that improve one of the schools' overall performances in the GCE examinations. The extra data collected saw great restrictive ICT access to students, and there is a shadow of doubt if ICT had an impact on the students' performance in the schools.

5.3 What is the role of administration in enhancing the use of ICT?

This question round up the findings of the use of ICT the Cameroonian schools. This issue was focus examining the role school leaders as well as the community has in enhancing the use of ICT. The school principal and parents view in this study was taken as the administration role in improving the use of ICT the schools.

5.3.1 Principal's Perspective of ICT in Education

To begin, considering principals as technological leaders, they were all asked to define their term what they knew about teaching and learning using ICT. The principals all positively commented on the use of ICT in the schools as a facilitating tool in the concept of teaching and learning process which ensures effective teaching. Upon defining the concept of teaching and learning with ICT, the principals unanimously agreed on the fact that the teaching and learning environment is characterised by two key players who are the teachers and students. According to their response, for students to have an education in a secondary school, they need stakeholders to guide and provide support in order catalyst the process of knowledge acquisition which nowadays can be effectively done through the use of ICT. This clearly shows the importance principals placed on ICT as a knowledge facilitating tool in this 21st century. Also from their response, it was evident that the principals saw ICT as a tool that can change the teaching and the learning process. This was evident from their reactions;

"The concept of teaching and learning with ICT, I think it means enabling the teacher who is the facilitator of learning use ICT tools such as; computer, overhead projectors, scanners, and any sound equipment, digital camera, and video camera. In another hand, learners can also use the tools to facilitate the learning process. So it is a two-way process".

From a technological leader perspective, the principals saw ICT as a tool that can transform the teaching and the learning process. According to the

principals, ICT act as a facilitating engine for teachers to get information which can be impacted to the students; as a result, ICT is a veritable tool for academics.

To continue, the principals also express the need for teachers to incorporate ICT in their teaching as they admitted that ICT is a tool that can transform the country. One of the principal added:

"The only recommendation I have is that ICT is a veritable tool that has come to stay so teachers should abreast themselves with the knowledge which is hidden in it so as to improve on themselves and the students to change our country".

5.3.2 ICT Programmes and Projects Set by the School Administration

It was evident throughout the analysis and observation that the utmost desire of the principals was to use their leadership positions to ensure that teachers and students are well equipped with technical skills as well as *technological pedagogical* and *content knowledge to* integrate ICT through seminars put in place by the schools and the delegation in charge of secondary education. One of the principal was actively making use of the computer science department in the school to enhance the use of ICT. This principal admitted that many teachers had not been formally trained to use ICT in their subject area. It is usually costly to hire professional ICT coordinators to train these teachers; as a result, the ICT department is now offering training programs for teachers. In these training programmes, teachers are taught how to use Excel, Microsoft and other educational software in their classrooms. Here the principals were practising a shared leadership style as they assigned the ICT department to provide training for teachers. The principals both talked about the positive ICT environment they have set up in the school where ICT staffs are now encouraging teachers to have their lessons in the school multi-media centre. The principals talked about creating a collaborative platform for the teachers and ICT department where the ICT department had come up with a "question bank" directed to teachers to channel in problems they faced using ICT and also ways they can work together towards using ICT as the main pedagogic tool in the schools.

"Staffs who are running our multi-media centre are encouraging teachers to come and have their classes. For example, it could be in such a way that in biology class using the ICT resources students can see simulations of how organs function in the body and many more practical lessons, it will be much more interesting".

During this study, it was interesting to note that one of the schools, there is a vice-principal-in-charge of running the school multi-media centre. The school principal was happy with such a position created in the school to enhance the practice of ICT. The principal said:

"We now have a vice principal who controls this computer centre who is there to inform me and the administration of what is going on all the time. So I want to encourage the vice-principal of this school and the administration of this school to continue with the marvellous job they are doing to enhance the use of ICT".

According to observational studies from both schools, many teachers were found individually on the school computers in the multi-media centre. Further investigation was carried out as of why these teachers were actively using the ICT independently using the ICT multimedia centre. Results reveal that the school administration had just created a school online student report card system where teachers are obligated to create an intra-school account to submit students' assessment information. This enables the principals to qualify as a technological literate principal concerning making decisions regarding application of technology. Also, the responsibility of the principals here was aimed at creating conditions that would enable teachers in the school to integrate ICTs into professional development practices. Both principals highlighted that these programme put in place under their influence is another way of enhancing the use of ICT in the school as one of the principals said:

"We have developed a programme where it is now compulsory for all teachers to use the school multi-media centre. They go there to impute their scores and by so doing those who are so resistant even to touch the computer now have the opportunity to feel them, see the marvel, the wonders of the computer some even develop interest to the extent that they can even go there and do their research".

Through the influence of the principal, ICT competent teachers are now working with other subject teachers in planning model lessons with the aid of

ICT. The principal highlighted that this project is still in the preliminary face which implies that, there have not been a significant outcome of the programme.

"The computer science teachers are currently working on a programme to develop ICT model lessons in all subjects. They are now developing model lessons where a teacher can deliver to their students with the use of ICT, but it is still at a very underdeveloped level (preliminary stages)".

Though the principals used their leadership role to set up in-service ICT training in the schools, it was difficult for them to coordinate the programme as it drew little attention from the teachers. Many teachers were not showing interest to attend these training which as a result indicates that the principals were not using their position as technological leaders to motivate and orientate teachers on the importance of these seminars. Unanimously the principals said:

"There are so many training that we encourage teachers to go in mainly in the domain of using ICT as a device in delivering their lessons. We try to organise in-service training for the teachers; unfortunately, we deal with adults here. Only those teachers who are interested participate in ICT training we offer".

Furthermore, besides the in-service training organised by the schools and the Delegation in charge of Secondary Education, the principals are also using their personal initiative in connecting ICT resource persons to teachers and also personally encouraging parents to invest in the school ICT infrastructure, this was evident from both principals' comments:

"Let me tell you some of the things we do. I got in contact with a Non-Governmental Organisation (NGO) that gets used computers abroad refurbished them and bring them here, some of my colleague who was interested got their laptops at a much-reduced rate and most of them are using these computers in their profession".
Another principal said:

"The Parents Teachers Association (PTA) has through my advice put in a lot of money in the use of ICT in this school. This year alone we have a budget of about 7.6 million FCFA (11,586.13 EURO). Is not something which is easy to run that is why many other schools do not have the ICT facilities we enjoy here. It takes a bold principal like me to be able to ask parents to invest in ICT infrastructures in the school".

The principals admitted they had little to contribute to influencing the use of these tools in the schools because most of the decisions about the curricula planning and scheme of work are drawn by the Ministry of Secondary Education. Though the principals all explain their desire to change the teaching and the learning process in the schools, they were all faced with difficulties when it comes to providing ICT tools and resources as a result of limited finance. The principals all admitted that budget allocating for the running of the schools were limited and they could not afford some essential ICT tools. From the principal's' view, it is evident that leadership in Cameroonian schools is hierarchical making it difficult for principals to take major leadership decisions without consulting their subordinates.

One of the principal said:

"We have running credits that come in from the government. For example last academic year I receive a running credit of 2 million FCFA (3,048.98 EURO) for a school of more than 3600 students that is grossly inadequate. The running credits are in the form of treasury bonds where taxes are paid and cut from, and then the contractors who provide the services to the school also pays themselves, so we are not talking about money at all. That is what I mean by inadequate resources. If you look at our structures they are not very clean, we cannot paint them, and we don't have the money to do that."

Principals were further asked what they think the Ministry of Secondary Education could do to enhance the use of ICT in the school and one of the principals said:

"I think one of the ways to encourage the utilisation of these tools in our schools is for Ministry of Secondary Education, for example, can subsidise the cost of a computer so that everybody in the school can own one. Another thing that can be done by the ministry of secondary education is to ensure that each school has sufficient ICT tools and ICT technicians because the problem we face here is that we need technicians to maintain the ICT tools".

Furthermore, it is believed that guided policies for the integration of ICT in a school is necessary for effective use of ICT in a school and thereby can be enhanced by the leadership role of the principal. It was evident from various responses of the principals that the school understudy has no particular goal or

vision for the integration of ICT. At these schools where the study was carried out, both vision and mission statements were present, but it was not aligned with the use of ICT in the school. This shows clearly that the principal was not yet ready in to incorporate ICT in their schools. This was evident from a respond of one of the principal.

"What I can say is that we have set goals, but we do not set a specific goal only for ICT. I think that is a fair enough point and is something that we can learn as a challenge and set a goal for ICT integration in various subjects".

The Analysis clearly shows that school principals in the 21st-century profession is are becoming more and more sophisticated with the introductions of ICT in schools. Principals in the study were all committed to enhancing ICT practice in the school. In an attempt to this, they supervised in-service ICT training in the schools; motivated teachers to attend in-service training organised by Regional Delegation in charge of secondary education, and further used their position to influence the community to invest in ICT infrastructures in the schools. On the other hand, the principals did not mention any guided policy, goals or mission statement in the integration of ICT, thus this serve as a barrier to the use of ICT in the schools.

5.3.3 Parents Enhancement of ICT in the school

Effective use of ICT in Cameroonians schools cannot be discussed without making mention of the role the community is playing to enhance its use in education. While observing the schools, it was apparent that the communities under study were playing vital roles in improving the use of ICT in the school. The majority of the ICT infrastructures and facilities are made available through the partnership between the school and the community through the Parents Teachers Association (PTA). In addition to registration fee paid each academic year, parents are obligated to pay an additional fee for ICT which are used to run the school multi-media centre. Also after interviewing the parents, it was thought-provoking to know that parents of both schools have been supporting the government back in the implementation faces of ICT in the schools. Up till

date, parents are still actively taking part in the day to day running of the centre. One parent said:

At that first face of implementing ICT in this school, each parent was levied 5000 FCFA (7.62 Euros) to make the multi-media centre much more useful. After that year, we came up with a computer fee of 2500FCFA (3.81Euros) per student each academic year for the running of the centre. We are doing all this to ensure that the children are well informed and well built up and equipped with ICT skills.

According to the analysis, the parents had a positive attitude towards ICT in education as they express that by enlisting the importance of ICT in the 21st century. One of the parents said:

"I went to school in the 1970s, computers were not there at the school at that time, but children are now opportune to have this education which I think is a big step of turning the 21st century into a technological knowledge society. I believe that this school is doing its best to be part of it".

The other parent added:

"I think teaching our children with ICT is quite a fantastic idea as we all know the world is already becoming a global village. ICT has open us to the world, and I think anyone nowadays who is not ICT inclined can be regarded as been locked in a cage, making him/herself an island because ICT links us to the rest of the world".

There was the presence of continuous collaborative practices between the school and parents in enhancing the use of ICT. From a parent interview, it was evident that one of the schools was actively orienting the parents about the importance of incorporating ICT into the teaching and learning process during the PTA meeting. One of the most striking discoveries found in this research was that parents were supporting each other through advises of the importance of equipping their children with ICT tools. A parent said:

"Because we have been told through series of meetings organise by the school that anybody who will be left behind will be like somebody in a cage. We as parents of this school said no our children cannot be left behind. Consequently, we are now encouraging one another "Hey my friend you know if your child does not have a real mastery of ICT he/she will be limited." So we try to encourage one another to pay the ICT levies to support the school, support the government to teach or to impact ICT

skills in all fields to our children else as I say we shall be left behind. I tell you we don't want to be left out; our community feels that if we are left out, then we will be cut off from the rest of the world".

The Analysis reveals that the responsibilities of the parents were not only geared towards providing funds to run the school multimedia. The parent were all seriously monitoring the ICT facilities and how teachers are using the tools in the teaching and learning process. The parents were actively using their children to oversee the utilisation of the ICT in school and the outcome. This parent clearly explained:

"As parents, we have our monitoring elements and one of them is our children. Our kids usually come and report to us. "Daddy we have been using this ICT tools, daddy we have not been using this ICT tools in school". So we always use these reports from our children as our control elements to go back to school. For example, if children come back and say "Daddy we have not been using the school multimedia centre" it is our responsibility now to meet the principal who is the administrator of the school and find out for myself. If the explanation is such that is something we as parents can do to improve the situation, then I take it as a top priority, but if is such that the school can handle, and then I leave it at the level of the school to handle".

Additionally, the parents were also supporting their children at home in using ICT academically in their studies. The parents admitted making available ICT tools at home to facilitate their children's learning. One of the parents said:

"For example last time one of my sons asked me for 40000FCFA (61 Euros) to buy a smartphone, in the beginning, I was resistant, but I ended up buying him the phone. I have realised that he has been using the phone in such a good way for looking up relevant information concerning his studies".

Despite the investments in ICT infrastructure and facilities put in place by the school in partnership with the parents and the positive attitude towards ICT in education, predominantly, one of the parents was worried about ethical issues concerning the use of ICT and saw ICT as a distracting tool to his children. The parent repeatedly expresses his dissatisfaction with their children use of ICT, as a result, limited the kids towards the use. This parent explained

that ICT is still a new concept and it will take time for his children to use the tools properly in academics. He said:

"The negative site which we as parents are always afraid when our children use these ICT tools is this cyber criminality which is rampant nowadays in our society. You know youths get into it to dupe others, even cyber terrorism. I think most of our children exploit these tools in a negative way like there are no restrictions on them browsing through pornographic sites. There are a lot of aspects that constraints our children to make proper use of the ICT tools and resource academically".

A question was further asked the parents to explain the strategies they are using to make sure their children are using ICT in their academics back home. One of the parents said:

"I don't know about other parents, but for me, I try to follow up my children with their handset and computer to see the kind of information they are following. From time to time I can ask for their handset or computer to filter through their browsers, and if what I find is not comfortable enough for me, I either warn or educate them of the adverse outcome or sometimes I take it from them so they can adjust".

This analysis has clearly shown that parents are the forefront runners of enhancing the use of ICT in Cameroonian schools. Parents were able to disclose the contributions they are making in providing finance for school ICT infrastructure facilities. The parents did not only invest in the ICT services in the schools but were able to equip their children with the tools. Added to this the parents were able to regulate their kid`s use of the tools and make sure they are using the tools for their academics.

6 DISCUSSION

6.1 Introduction

This chapter studies the results of findings of the pedagogic use of ICT in the teaching and the learning process from a qualitative perspective, regarding the context of Cameroon closely linked with the theoretical framework and relevant studies emerging from the literature review. This section will follow the three central research questions, utilising evidence from the qualitative analysis previously considered in chapter six. It is of interest for the reader to note that there were three primary research objectives initially mentioned in chapter one:

- Exploring the Use of ICT by teachers in the teaching and learning process.
- Examining the Impact of the use of ICT in the pedagogy.
- Investigating the enhancement of the ICT in the pedagogy by the school administrators consisting of the school principals and parents

These objectives were later developed into three research questions which the researcher then attempt to answer:

1. How do teachers use ICT as a pedagogic tool in the teaching and learning process?
2. What is the Impact of the use of ICT on pedagogy?
3. What role do the school administrators play in enhancing the use of ICT?

6.2 Exploring the Pedagogic Use of ICT

One of the aims of the 21st century in education is for teachers to develop appropriate skills and knowledge to integrate ICT effectively in the teaching and learning process either through pre-service or in-service training programmes. Therefore it is necessary for every teacher to use ICT tools successfully in their classroom practice pedagogically. After exploring the pedagogic use of ICT through observations and interviewing teachers in an

attempt to answer the first research question which focuses on the pedagogic use of ICT, it was evident from the analysis that the pedagogic use of ICT was not exploited to it in full potentials in these schools. Unfortunately, ICT had not fundamentally changed the teaching practice of the school. The methods of teaching or ways teachers in the both schools used in designing their learning experiences in classrooms were well known and traditional executed. Almas and Krumsvik (2008, p. 106) assumed that majority of teachers are still yet to exploit the creative potential of ICT by engaging students more actively in the production of knowledge. After interviewing the teachers and observed various strategies they use ICT in the classrooms, it was evident that ICT was underexploited as the students and majority of the teachers were passively involved in its use. As passive users, they were more focus on using ICT in preparing their lessons, evaluation practices and finding materials over the internet. Limited efforts were made by some ICT novice teachers to create a student-centred learning environment where the students actively engaged in knowledge creation. Even though in-service ICT training was actively executed in the schools and by the delegation in charge of secondary education, interviews with the teachers and observation clearly show that these trainings were the focus in equipping teachers with TK and TCK instead of TPK.

6.2.1 Actual Pedagogical Use of ICT

Few of the teachers considered active users, had good *Technological Knowledge* (TK) and *Technological Content Knowledge* (TCK). This alone was not enough to guarantee effective integration of ICT in the teaching and the learning process. Merely equipping the schools and teachers with ICT tools is inadequate (Almas & Krumsvik, 2008; Mishra & Koelher, 2006; Voogt 2010; Agyei and Voogt, 2012). The way teachers make use of the tools has the possibility to bring change in the educational system. It is evident from the analysis that even though teachers are widely exposed to ICT tools, their method of delivering lessons has not changed. Teachers are still focusing more on the teacher-centred (instructional) method of teaching even in cases where classrooms are equipped

with ICT tools. Evidently, from the analysis, it was evident that being competent in using ICT does not ensure effective teaching. Mishra and Koehler (2006) admitted that teaching effectively in the 21st-century demands teachers to be equipped with *Technological Pedagogic knowledge* TPK and Shulman´s (1986) *Pedagogic Content Knowledg*e resulting to the TPACK which they described as the full package for 21st-century teaching rather than just TC and TCK. Therefore the teachers lacked knowledge in integrating ICT in their classrooms. As a result, their method of transmission remained unchanged despite the presence of ICT equipment. Jonassen, Peck and Wilson (1999) argued that 21st-century teachers have to start creating innovative classroom practices where students are stimulated to engage in active knowledge construction. Mishra and Koehler (2006) added that this call for an open-ended learning environment where teachers are equipped with both Shulman´s PCK and TPACK. Figure 1

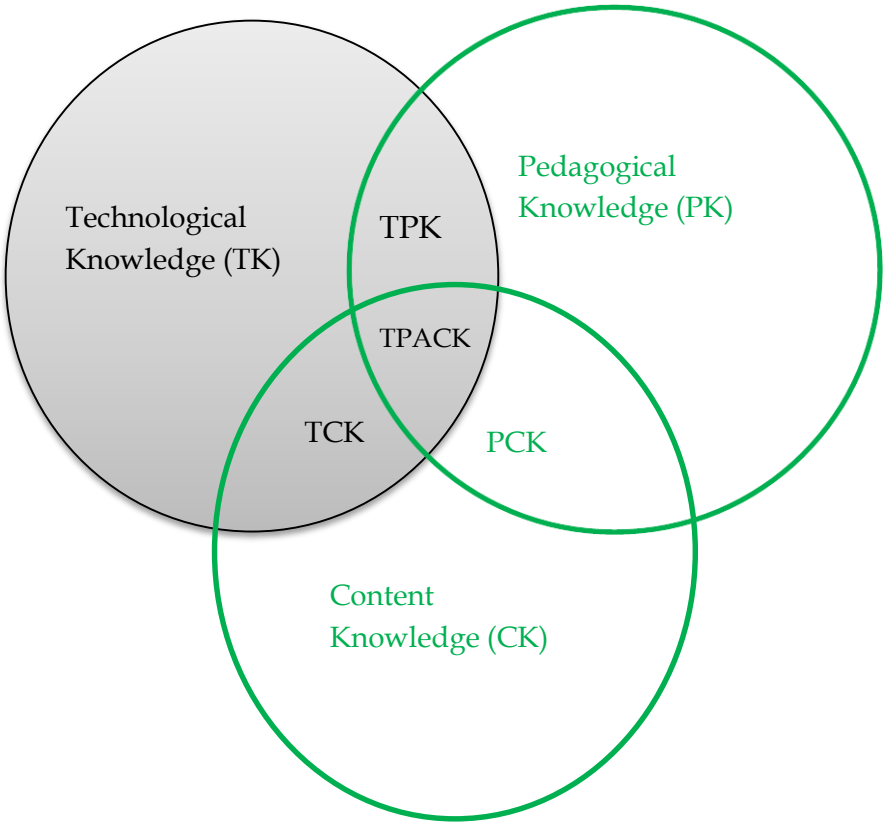

Figure 5 Teachers Inadequate knowledge of ICT integration

Figure 6 depicts the current situation of teachers with on the pedagogic use of ICT according to the analysis. This model was developed by Mishra and Koelher (2006) describing a framework for effective integration of ICT in the classroom. From figure 6 above, some of the teachers knew how the tools functioned (TK), and were able to access materials using the ICT but did not have sufficient knowledge to integrate ICT in their subject areas (TCK and TPK). Evidently, analysis proof that teachers from both schools knew the importance of ICT in the pedagogy, consequently, some of them had knowledge of how the tools were operating and where to get materials in their subject area. The black circle (TK) stands for lack of knowledge to integrate CK and PK in the classrooms. Following from this most of the teachers lacked knowledge (TPK) on how ICT tools together with a variety of information in it can be used properly so as to engage their students more in it. ICT was predominantly used in most of the classroom to strengthen the instructional transmission of knowledge. In other words, the most teachers did not change their role in the classroom as sole knowledge impactors. TPACK which supposed to be the common element between the three circles, forming the basis for the effective pedagogic use of ICT as asserted to Mishra and Koelher (2006) in the classroom is partly encircled with green and black lines showing insufficient knowledge to use ICT in the classrooms.

Further analysis revealed majority those teachers who were proficient in the use and considered active users mentioned using the tools mostly for research purposes, preparing their lessons and presenting them. This study is congruent with Cuban (2001) investigation of the use of ICT in the Silicon Valley schools in the United States of America, where teachers who were more proficient in using ICT focuses on internet search and word processing (TC, TK, TCK) instead of constructivist use whereby students actively partake in the teaching and learning process. In other words, ICT tools such as projectors, computers, and virtual lab software were used to support the traditional

instructional method of teaching. Similarly, examining the effect of ICT in Finnish lowers secondary school during the years 1994-2001, Ilomarki, Lakkala and Lehtinen (2004) noticed that ICT was not used to transform the teaching method but to support content domain. Mishra and Koelher (2006, p.1029) insisted that effective teaching requires an in-depth understanding of the complex relationship between technology, content and pedagogy. They further agreed that productive ICT integration requires all three issues not in isolation, but rather within an interconnected relationship.

6.2.2 Teacher ICT competence and Skills

Mishra and Koelher (2006, p. 1033) "Merely knowing how to use technology is not the same as knowing how to teach with it. They stated that learning new skills with ICT is not enough to develop an adequate understanding of it using in classrooms. Despite efforts made towards the use of ICT in teaching, it was evident from the findings that majority of the teachers were unaware of how to use ICT pedagogically. In the course of this study during observation, it was apparent that ICT-based activities were not carefully thought for specific topics and objectives. Instead, ICT was used without real purpose and not in the context described by Carlson and Gaido (2002) as a wrong and shallow use of ICT in education. As a result, it becomes a challenging task to prepare teachers to use ICT pedagogically more often in a more efficient way. Many educational systems around the world, both pre-service and in-service teachers are offered just basic ICT courses to prepare them to use ICT in their classrooms. As a result, the pedagogic use of ICT still posits as a major problem in education (Cuban 2001; Agyei & Voogt 2010; Li 2007 & Chigona & Chigona 2010). Also, it was interesting to note that teachers admitted having a private computer at home but still comfortable with the typical instructional method of teaching. As a result, it did not change the way they deliver their lessons. Similarly, Becta (2004b) study concluded that teachers who are not well skilled in using ICT pedagogically feel anxious about using it in front of their students.

Inasmuch as the schools as well as the delegation of secondary education was organising ICT training seminars for teachers, analysis from interviews and observation revealed that these in-service training were not sufficient to fully equipped teachers with the required TPACK framework to integrate ICT in the teaching and learning process effectively. The training offered to teachers mostly concentrated on TK where teachers were taught how to manipulate ICT tools. In some cases, some teachers admitted that the training also improves the teachers TCK as they talked about using ICT tools to prepare their lesson and searching materials related to their subject domain. Insufficient in-service training for teachers to integrate ICT in their subjects' areas and the lack of interest on the part of the majority of the teachers to attend these seminars resulted in the ineffective integration of ICT in these schools. The majority of the teachers could not effectively integrate ICT collaboratively for their students to partake in classroom activities actively. This study is coherent with Nkwenti (2010) review of in-service ICT programmes for Cameroonian teachers, where he concluded that only 1.2 percent of teachers had undergone in-service ICT training on the practical use of ICT and more than 60 percent of the training skills acquired are mostly endowed with *Technological Knowledge*. Becta (2004b) report argued that if teachers' are to be persuaded of the importance ICT in their teaching, their training should focus on pedagogical issues. Unfortunately, ICT in-service training was organised few times per semester. As a result, teachers complained of limited time to incorporate ICT skills. Carlson and Gaido (2002, pp. 119-112) review confirmed that traditional one-time in-service teacher training workshops which include knowledge in primary operating systems, word processing, spreadsheets have served as an obstacle towards the effective pedagogical use of ICT. More recent research carried out in Norway found that the main problem with pedagogical use of ICT was the insufficient amount of in-service ICT training programmes (Almas & Krumsvik, 2008). Schools need to provide training courses for teachers to gain experiences in dealing with new and modern ICT tools in different pedagogical approaches. Concretely, as it can be seen from the teachers'

responses, they all presume that more time should be allocated for professional development programmes.

Teachers' personal effort proves to be one of the major enablers in the pedagogic use of ICT in the classroom as they managed to convert their obstacles into enablers. Relentless efforts were made by two out of the twenty teachers' interviewed to incorporate ICT in their classroom despite difficulties ranging from faulty ICT hardware and software, insufficient electricity. In-depth investigation shows that these teachers had taken crash courses on ICT or private ICT courses. While on the other hand, other teachers interviewed were limited to the ICT tools available in their classrooms and could not incorporate ICT as they complained of inadequate ICT facilities in the school. The lack of individual effort and interest was also recognised by Pelgrum (2001) as one of the obstacles to the pedagogic use of ICT. In the same manner, Robertson, Webb, and Fluck (2007) observed that "teacher personal entrepreneurship" stands as a key factor in the innovative use of ICT in the classroom. Unfortunately, most research studies on the pedagogic use of ICT carried out in Sub-Saharan African, particularly in Cameroon are still yet to recognised the importance of individual effort in ICT integration.

6.2.3 School Access and ICT infrastructure

One of the repeated responses made by the teachers concerning the use of ICT was linked to the access of the ICT tools and ICT infrastructure in the schools. Teachers complained of limited access to ICT tools in the schools due to the school timetable structure. All the teachers addressed the lack of time to effectively use ICT in the classroom. Becta´s study (2004b) found that the lack of time for teachers to effectively use ICT in the teaching and learning process exists in many aspects of their work. This includes time needed to prepare their lessons, exploring and pedagogical class usage of ICT, inadequate time to deal with technical problems. Voogt (2010) concluded that one of the main reasons why teachers do not use ICT pedagogically in the classroom is the lack of time necessary to accomplish the pedagogical plan. Kozma, McGhee, Quellmalz and

Zalles, (2004) findings from the World Link programmes conducted in several countries all over the world is quite similar to this study as they found out that the biggest problem teachers faced in pedagogically using ICT are the lack of time for ICT activities. They suggested that it is important for schools to help teachers by providing sufficient time to incorporate ICT in the teaching and the learning process.

Furthermore, it was evident from the observation that there was an average of 60 students per class. As a result of this, teachers admitted that it was difficult incorporating ICT in such an environment as a consequence of the large class size. Added to this was the limited number of computer available in the school multimedia centre. From observation, the class sizes were too large as compared to the number of computers available in the school multimedia centre. After exploring teachers' practice of ICT in 26 countries on the main difficulties faced in integrating ICT in schools, Pelgrum (2001) concluded that two of the ten main barriers were the insufficient number of computers compared to the number of students and inadequate ICT tools to match the students' number. Cuban (2001) points out that teachers have so many students to teach and so many topics to cover along with increasing accountability demanded from them, therefore, it is simply too difficult for them to incorporate ICT as a regular instructional practice in their classrooms. Despite the limited ICT tools and a high number of students, some teachers instead use this class structure to cultivate collaborative practices with ICT as they pair students four to five per computer. One teacher mentioned that this was a perfect strategy for the students to work together and learn from each other. Becker (2000, p. 5) findings on teaching, learning and computer survey confirmed that school subjects where teachers are more likely to have a 1:4 ratio of computer to students (one computer for every four students) are the same subjects where frequent use of the computer is more likely.

6.3 Impact of the Pedagogic Use of ICT

This section seeks to examine the different implications of the use ICT had in the teaching and learning outcome in both schools. It was evident that the way teachers in both schools in this study make use of ICT determined the impact it had on the teaching and the learning outcome. The pedagogic use of ICT on students' achievement was also examined.

6.3.1 ICT Impact on Teaching Outcome

Results from the analysis show those teachers who considered themselves competent in the use of ICT and were actively making use of the tools and reported a significant change in the way they prepared and deliver their lessons. These teachers saw the use of ICT as vital in the teaching and learning process and were actively making use of the in-service training organised by the school and the delegation in charge of secondary education. This Research clearly revealed that the few teachers who benefited from the later training and also personal, professional development change the way they were delivering their lessons. Due to the frequent use of ICT tools as admitted by some of the teachers, their teaching methods were refined. While some teachers claimed they have become confident in delivering their lessons through diverse information they got in their subject area using the internet, others admitted that they can now plan their lessons without much difficulty with the use of their personal computers at home. Others admitted it was easy to prepare and evaluate students using ICT. Kozma, McGhee, Quellmalz, and Zalles (2004) confirmed that pedagogic use of ICT is aimed at constructivist and collaborative practice amongst the students, but education in many countries is still based on behaviourism making it difficult for teachers to enjoy the full potential of the use of ICT in the classrooms. Consequently, data seems to suggest that the main reason why ICT was introduced in education was not clearly understood by the teachers as the student in this study are still considered as a passive recipient of

knowledge. Just two out of the twenty teachers interviewed admitted that ICT has profoundly changed their teaching styles from a pedagogic instructor to a guide or coach. As a coach or guide, they gave examples of using ICT in collaborative and project base activities with the students actively participating in their learning. The teachers were there just to make sure the students were on the right track.

Lastly, from the analysis, it was apparent that some teachers were strongly resisting the use of ICT in the teaching and learning process. These teachers argued that ICT had no place in their subject area and they could not imagine any situation where ICT could be incorporated into the classrooms. As a result, they admitted that ICT had no impact on their teaching outcome. Later investigation about their backgrounds proof that they were resistant to taking professional in-service ICT training organise by the schools and the delegation in charge of Secondary Education. Becker (2000, p. 11) predicted that teachers who believe in a more traditional transmission-oriented approach usually finds ICT tools incompatible with their instructional goals. Consequently, pedagogic use of ICT has no impact on their teaching.

6.3.2 ICT Use as Collaborative Tool to Enhance Teaching and Learning

Mishra and Koelher (2006) admitted that the TPACK framework enables teachers to relate creative ideas using ICT tools in the teaching and learning process for students to scaffold their learning. It appears that pedagogically, though the majority of the classroom environment were more teacher-centred oriented, however learning became more student-centered in some classrooms due to the innovative use of the ICT tools. Teachers considered ICT use in their classes very supportive in that it helps to reduce social disparities between the students since they were sometimes found working together in teams to achieve a given task. For example using virtual lab software, creating online weblogs where students could read lecture notes online and make comments for others to see and sending questions through mobile applications like Viber and

WhatsApp clearly shows that some of the teachers were using ICT to enhance collaborative learning practices in their subject areas. Similarly, these teachers reported an increase in conducting multiple parallel activities in their classrooms, engaging students in project-based-learning and also giving students' excellent choices in the various tasks they undertook. As a result through an advanced integration of ICT by two of the teachers through collaborative practices and project- based learning, students were able to work together; teachers were able to improve their curricula and the students' attainment of the concepts increases. Teachers' knowledge about how to use these tools, pedagogical presenting information using the tools and actively engaging learners constituted their TPACK considered by Mishra and Koehler (2006) as the basis for effective teaching. These findings also fall in line with Almas and Krumsvik (2008, p.104) review which insisted that effective use of ICT in education has to be associated with collaborative practices, project-based-learning, student-centered learning and active student participation. King, Joy, Foss, Sinclair, and Sitthiworachart, (2014) concluded that flexibility in the pedagogical use of ICT gives room for more interactive learning rather than the traditional method of teaching with the absence of ICT.

6.3.3 ICT Impact on Learning Outcome

This study tries to present some important aspects which have an influence on the impact of ICT on students' performance. Analysis from this study shows that some of the teachers saw ICT as a vital tool in the teaching and the learning process and thereby started to incorporate it into their lessons. By relating what is taught to real life situations with the use of ICT, the teacher claimed that it was much easier for their students to understand the concept explained. This is consistent with Cuban´s (2001) review, where he advocated that for the past years, the expectations have been to make schools more efficient and productive, through the transformation of the teaching and learning process

into an engaging and active process connected to real life, in order to prepare the students for their future jobs.

These teachers did not only describe the changes ICT had made in their classroom whereby students are now more active in the classrooms but also highlighted the significant improvement in students' performance as a result of their use of ICT. From observation and interviews, it was interesting to note that one of the schools had been ranked among the best government schools in the country concerning the students' performance in the last national examination (GCE "O" and "A"). The teachers attributed this high performance to the ICT implementation in the school and their professional development especially in the pedagogic use of ICT. On the other hand, there remain doubts if this improvement in students' performance claims were directly linked to the usage of ICT considering the low level of ICT integration in this school according to observations. Similarly, the Becta (2004b) research claimed that despite numerous impact studies, there are still difficulties in measuring the impact of the use of ICT on student performance. Kozma, McGhee, Quellmalz, and Zalles (2004) held the view that ICT is evolving and their effect on students' performance are difficult to isolate from their environment. Instead, the standard approach to examine the impact of ICT focuses on achievement and curricular and not performance. Therefore it can be confirmed from this research that ICT impact on student performance has not been proven. A positive impact of ICT is more likely linked to pedagogy, where it is assumed that ICT can have a positive effect on student achievement and not "performance" when it is used appropriately by teachers in their classroom practices. Becta (2004b) research which examines the impact of ICT on United Kingdom's schools concluded that since students' performance is mostly characterised by teachers´ characteristics, educational environment and students' characteristics, therefore, ICT may have an impact on these determinants and consequently an outcome in education. After examining Silicon Valley schools in the United States on the integration of ICT, Cuban

(2001) insisted that ICT has a significant impact on students´ learning processes and not the students` overall performances.

Furthermore, in the analysis, teachers repeatedly complained that most of the students could not follow their lessons because they had insufficient technological knowledge. This limited ICT knowledge by the students was translated by the teachers an obstacle for successful integration of ICT in the classroom. Some teachers held the view that most of the students are coming from homes where ICT tools are absent as a result it becomes difficult for them to follow ICT incorporated lessons. It was also difficult for them to introduce more complex concepts in their subject area as it will demand all the students to have excellent skills in the use of ICT. More so, the analysis shows that the teachers and principals were afraid of students' non-academic use of ICT, voicing their concern that even those students who had real technological knowledge hardly use the tools for their academics. Similarly, reports from the Organization for Economic Cooperation and Development (OECD, 2004) found that students were having excellent ICT skills when they use their computers for communicating via email or chat rooms, playing games and browsing the internet, while the academic use of ICT appears is on a decline.

6.4 Role of the school administrators (Principals and Parents) in Enhancing the ICT in the Pedagogy

The pedagogic use of ICT in any school system is strengthened by the school administrators with the principal being the forefront initiator or runner to ensure successful integration of it practices in the school. School principals' stands as forerunners in any pedagogic activities taking place in the school and their influence can either impede or encourage the practice of these activities. Also, the immediate community where the school is located is considered as the major partner in enhancing pedagogic practices in the school. In this section, results of school principals and parents enrichment of the pedagogic use of ICT are going to be discussed

6.4.1 Principal's Role

In both schools, the principals were highly engaged in enhancing ICT practices in the pedagogy. They were actively involved in supporting the use of ICT through the supervision of in-service ICT training programmes for teachers. Observational studies saw that these teachers were mainly taught how ICT tools function rather than using them in the teaching and the learning process. However, both principals were not performing well in their role as technology leaders. The training offered in their schools for teachers did not help them to integrate ICT in their lessons practically. Also, there were several individual attempts made by the teachers to use ICT in their classrooms, but without any support from the school leadership. The principals failed in their role as technological leaders as they were weak in making timely decisions in enhancing the use of ICT in the schools. They held the view that ICT was still a new concept in education, as a result, minimised their influence as technological leaders claiming that it will take a longer time for teachers to incorporate ICT in their lessons thoroughly. Similarly, Schiller (2002) asserted that some principals are still dormant, holding the notion that ICT is still in the initial stages in education. After examining the role Taiwanese principals take in enhancing the use of ICT by the teachers, Wang (2010) concluded that secondary school principals lack strong leadership act in improving the use of ICT. Wang further suggested that school principals must believe and act vigorously on the conviction that it is their responsibility to encourage teachers to address issues concerning the use of ICT in their classrooms.

Distributive leadership practices were present in both schools when it comes to enhancing the pedagogic use of ICT. Principals shared their powers with the ICT department who were responsible for organising in-service training programmes for teachers. The analysis reveals that in one of the schools, the principal was initiating collaborative practices between the teachers and ICT department by motivating ICT competent and non-competent teachers to work together. Both principals were also motivating teachers to attend further ICT training programmes organised by the delegation of in charge of

Secondary Education apart from the in-service training going on in the school. Wang (2010) insisted that no matter how persuaded teachers maybe about the importance of ICT in the pedagogy, they will not achieve much if their principals do not motivate them. Flanagan and Jacobsen (2003) are of the opinion that to improve education, principals must adapt their management and leadership styles to motivate teachers to use ICT in their professional curriculum practices.

To enhance the use of ICT in the pedagogy, the principals took the role of community leaders by actively involving parents and other non-governmental organisations. The principals used their role as the school leaders in encouraging parents to invest in ICT projects, networking with international non-governmental organisations abroad and locally to supply refurbished ICT tools to the schools in reduced rates. One of the principal connected the teachers to expert dealers of ICT to buy cheap computers. Similarly, Flanagan and Jacobsen (2003) asserted that principals are regarded as technology managers by supervising and providing ICT resources in schools.

Fullan (2006) insisted that a school that does not have goals or vision relating to the use of ICT will not have a purpose for existence in the current dispensation, particularly in this enrich technology society we now find ourselves in. Both principals interviewed gave a detail explanation about their vision and mission statement of their schools. Unfortunately, they did not make mentioned of ICT. From their responses, it was clear that they had set overall goals in the school but no specific goal for ICT. Literature holds that school leadership is accountable for how well teachers teach and how much students can learn (Hargreaves 1994). Therefore setting a goal, and creating a sense of commitment that binds teachers together and motivates them to fulfil their deepest aspiration is considered as the essence of leadership (Wang, 2010).

Evidently, we can conclude here that the principal role as technological leaders was driven by care for both human and physical resources, accepting accountability and their behaviours contributed in influencing teachers to appreciate and adopt ICT in their daily routine even though ICT was still

under-utilized in both schools. Carlson and Gaido (2002) suggested that principals are far more likely to encourage the use of ICT in the school when they participate alongside with teachers in in-service ICT professional training. Literature shows that majority of principals are still yet to understand their role as technological leaders. Schiller (2002) concluded there is very little literature on the relationship between educational leadership and ICT education.

6.4.2 Community Enhancement of ICT in the pedagogy

Cameroon educational system is structured in such a way that parents are considered as a vital stakeholder in education. This aspect was not absent in both schools. Through observation and interviews, it was interesting to note that parents got involved in the implementation of ICT in the schools since in its initial stages. The Parents reveal that it was their responsibility to ensure that their children have the best education, and they can only support this by actively working with the school especially in the ICT domain. They knew it was very expensive for the school alone to run and sustain ICT facilities. They had to come in through Teacher Parents Association (PTA) supporting the schools to build new multimedia rooms fully furnished and equipped with ICT tools to enhance the practice of ICT in the pedagogy. This is consistent with Kozma, McGhee, Quellmalz, and Zallas (2004) who confirmed after evaluating the World Link Programme that parents in developing countries are actively involved in financing ICT in schools.

Furthermore, it is interesting to note that the parents were not just supporting the schools by funding ICT related projects but also providing the tools for their children at home. As a matter of fact, Kerawalla and Crook (2004) outlined that majority of households are now interested in owning computers due to educational use by their children. While both parents interviewed acknowledged the importance of ICT for their kids' education, they were much more cautious on the kind of information their children were exposed to while using the tool. The parents were concerned about the non-academic use of the device and always checked from time to time if their children are using the ICT

tools for academic purposes. From the analysis it was obvious that the parents interviewed were able to discipline their children to use the tools mainly for their academics. As a result, they explained that their children were able to use the tool in their education. Similarly, Hollinworth, Mansaray Allen and Rose (2011) suggested that pedagogic use of ICT by the children can be enhanced when there is a form of restrictions and parental lockouts on home computers for the students to access only sites related to education. It is important to note here that parents played an importance role in the incorporation ICT in these schools. Parental influence in the enhancement of ICT is still a new field, and limited findings have been made in this aspect, and as a result, parental influence in pedagogic use f ICT has been neglected.

7 CONCLUSION AND RECOMMENDATION

This study tries to examine the pedagogic use of ICT in a school system involving relevant stakeholders who guide and controls the teaching and the learning process. After exploring the teachers´ pedagogical use of ICT in Sub-Saharan African schools, it is evident from previous chapters in this study that when the right framework are put in place focusing on integrating ICT in the curriculum, then the significant impact is felt in the teaching and learning process. ICT integration from literature does not only influence the way teachers teach but also what they teach. From this study, it is clear that ICT itself cannot be presented as an added value, but it is needed to build a robust connection between pedagogy and the content. ICT is required to flexibly fit different subjects of the curriculum with the pedagogy to assist the teaching and learning process. According to the finding from this study, it can be concluded that the pedagogic use of ICT has been influence by the availability of the tool, duration of the lessons, physical class structure, the students and teachers attitude, teacher´s own knowledge, class´s cultural diversity, student socio-economic conditions, school leadership style, community perception about ICT.

Beginning with the teaching process, firstly when teachers have the interest in continuous professional development, they are likely to start seeing ICT as a better tool to enhance their pedagogic practices. Secondly, after seeing the importance of changing their pedagogic practices, it is evident that they will start learning how to use ICT tools. In the course of learning, I suggest this is one of the most crucial stages of teacher development because if they are not guided, they might focus more on the *technological knowledge and content knowledge*, resulting in limited influence in their classroom practices. Throughout this study, this was evident, and it is quite clear to say that equipping teachers with *technological knowledge* seem to be the sole focus in most of the pre-service and in-service programmes. I believe if these programmes are transformed in such a way that pre-service and in-service teachers could be

taught through ICT it will radically change their attitude, belief and pedagogical practices. When these training are properly organised with a sole focus on exposing teachers to ICT in all domain of their subject area, it will be easier for them to use the tools in their classrooms effectively. Thirdly, the possibility for teachers to start extending their knowledge on ICT and experiencing learning about affordance of technology applications are necessary. This can help them in to explore more topics and concepts especially in situations where they find themselves with limited ICT tools. Successful integration of ICT in the teaching and learning process will demand some changes in the national curriculum. Also, teachers' individual effort to integrate ICT seems to be a brilliant effort taken by teachers to influence the teaching and learning process. But this individual initiative is not sufficient in a school schools system. Instead, I believe that integration of ICT will be more successful in a school, when teachers, students, principals and the community joint efforts and interest together and create a professional learning environment.

In addition to professional ICT training for teachers, educators and stakeholders have to start thinking of transforming their national curriculum framework entirely to incorporate the use of ICT in the entire domain. After carrying out this study, it is indisputable that national curriculum promotes the pedagogic use of ICT by the possible list means. A point made widely in the literature, analysis and discussion part in this research is that developing countries such as Cameroon need to move from mainly using ICT in the preparation of lessons and unit plan, organising students' scores and report to creating and managing ICT in pedagogic tasks. To enhance teachers' pedagogic use of ICT, it is further recommended that; sufficient time per lesson should be allocated to encourage teachers to use other pedagogical practices especially ICT. Classrooms structures should be created in such a way that promotes collaborative practices. More investment should be directed to moving ICT tools to classrooms instead of building multimedia centers; allocating more funds to teachers professional development instead of buying more and more computers each academic year; making in-service training compulsory for all

teachers instead of optional; making access to ICT possible for all teachers despite their subject area; establishing broadband network in the schools with fast internet connection for easy access to internet by teachers. Furthermore, I will recommend more intervention studies to be carried to actually gather knowledge on the ICT situation and the various means teachers can be helped to integrate ICT in their classrooms without any problems.

Providing access to the tools and training teachers to use ICT in their classrooms is just one of the ways to ensure effective teaching. This effective use of the device has to be transformed to the learning outcome. ICT seem to have a profound impact on the learning process in secondary school education as it offers new possibilities for learners. When teachers become competent enough to use ICT tool, the way they deliver their lessons changes. This study clearly indicates that teachers have to re-think their positions the classroom. Teachers have to understand that there is a significant impact on the learning outcome when students are more engage in the classroom. This Impact can easily be realised when ICT is used constructively in the teaching and learning process. As a result, students become more engage in collaborative classroom practices that improve their learning outcome. Therefore teachers are called upon to change their role from an instructional leader to an instructional guide or coach. From my little experience as a teacher and through my bachelor and masters studies in the education field, what I know about education is that the learner is the curriculum, engaging and listening to the student will enable the teacher to be more innovative.

Thus, certainly, literature about teachers pedagogic use of ICT in African countries is correct-ICT have not metamorphosed the teaching and the learning practice of the majority of academic subjects in secondary schools. Nevertheless, ICT can become a vital educational tool under proper conditions-where teachers are confident, and fairly skilled and competent in using ICT themselves, where the daily class schedule allocate enough time for teachers to use ICT, where there are sufficient ICT equipment made available and can easily be access to permit classroom activities to flow consistently with other

learning tasks, where teachers personal philosophy is to support a student-centered, and constructivist pedagogy that could further incorporate collaborative activities defined by students interest-ICT evidently are becoming invaluable and well-functioned tools in education.

The school principals and community also have a role to play to ensure that teachers integrate ICT in the pedagogy. The role of school principals seems to be in a more difficult if not complicated situation in this 21st century where we have seen a high influx of ICT tools in schools. In this study, principals were not aware of their new role they have to take as technology leaders. As a result of their unawareness, some of the teachers could not effectively incorporate ICT in their classrooms while others did not even have knowledge of how to use the tools pedagogically. School principals have to start seeing themselves as technological leaders making sure that teachers are motivated, trained, resourced, enforced, and guided to use ICT in the pedagogy. This study proved that when the school leader empowers the community to finance school projects, there is always the significant positive outcome. School principals have to realise that leadership is communal and does not only reside to an individual. Therefore principals are urged to engage and involve the community, Non-governmental organisation, ICT experts and educational researchers to transform their schools and prepare students to face the 21st - century knowledge economy. Overall, although these schools had several setbacks in integrating ICT in the teaching and the learning process, its success was due to extensive collaboration and professional commitment of all the stakeholders (teachers, principals, parents, students). As already shown in this study, ICT will only be successful when in schools when the school principal actively supports it, offer adequate professional development to teachers and encourage the other stakeholders in the process of change.

7.1 Future Research

Firstly, this study is limited to two public schools. As a result, I will recommend researchers who are interested in carrying out a similar study to examine the pedagogic use of ICT private schools as well.

Secondly, to improve understanding of ICT integration in Cameroonian educational system, it would be important to examine the pedagogic use of ICT from students view and the impact it has on their learning outcome.

Thirdly, this study presents only two case studies in Cameroon, yet the school structure and use of ICT in another part of Cameroon are entirely different. It may be helpful to conduct a mixed method study to examine the pedagogic use of ICT by teachers, students and principals in Cameroonian schools.

Fourthly, since ICT is still an emerging concept in Cameroonian education, it would be important to conduct a comparative study in the teachers' use of ICT in rural and urban schools. In this way, a more general picture could be achieved that is not offered in this study due to its qualitative nature with a small number of participants. Also, I will recommend a comparative study between schools in Cameroon who are still in the primary face of the integration of ICT to more advanced secondary schools in western nations, for example, Shangai-China, Hong kong-China, Finland, and Japan who are among the top educational systems in the world.

More so, a further investigation of the teacher education programme should be carried out with the aim of examining the kind of ICT training pre-service teachers are taking and how this training helps them in their profession.

Further research should be carried out to investigate the reciprocal relationship between pre-service and in-service teachers' attitude and beliefs towards the use of ICT in the curriculum. The aim of the study could be to find out their views about beliefs and actual practice of ICT incorporation. This perspective would be more applicable using comparative studies.

To continue, further studies should focus on carrying out experimental research designed to cover more geographical locations to unlock realities of the ICT existing practices in teacher training colleges all over the world.

Students in Cameroon secondary schools, students are not allowed to carry ICT devices to school because it assumed that it is a distracting tool in their academics. I will recommend future research to examine the use and impact of mobile devices on students learning outcome through pilot studies.

Lastly, a more in-depth study should be carried out to examine principal attitude, belief towards the role as a technological leader which is still regarded as a new concept in the field of education and how they can exercise their function in the schools to enhance the practice of ICT in the curriculum.

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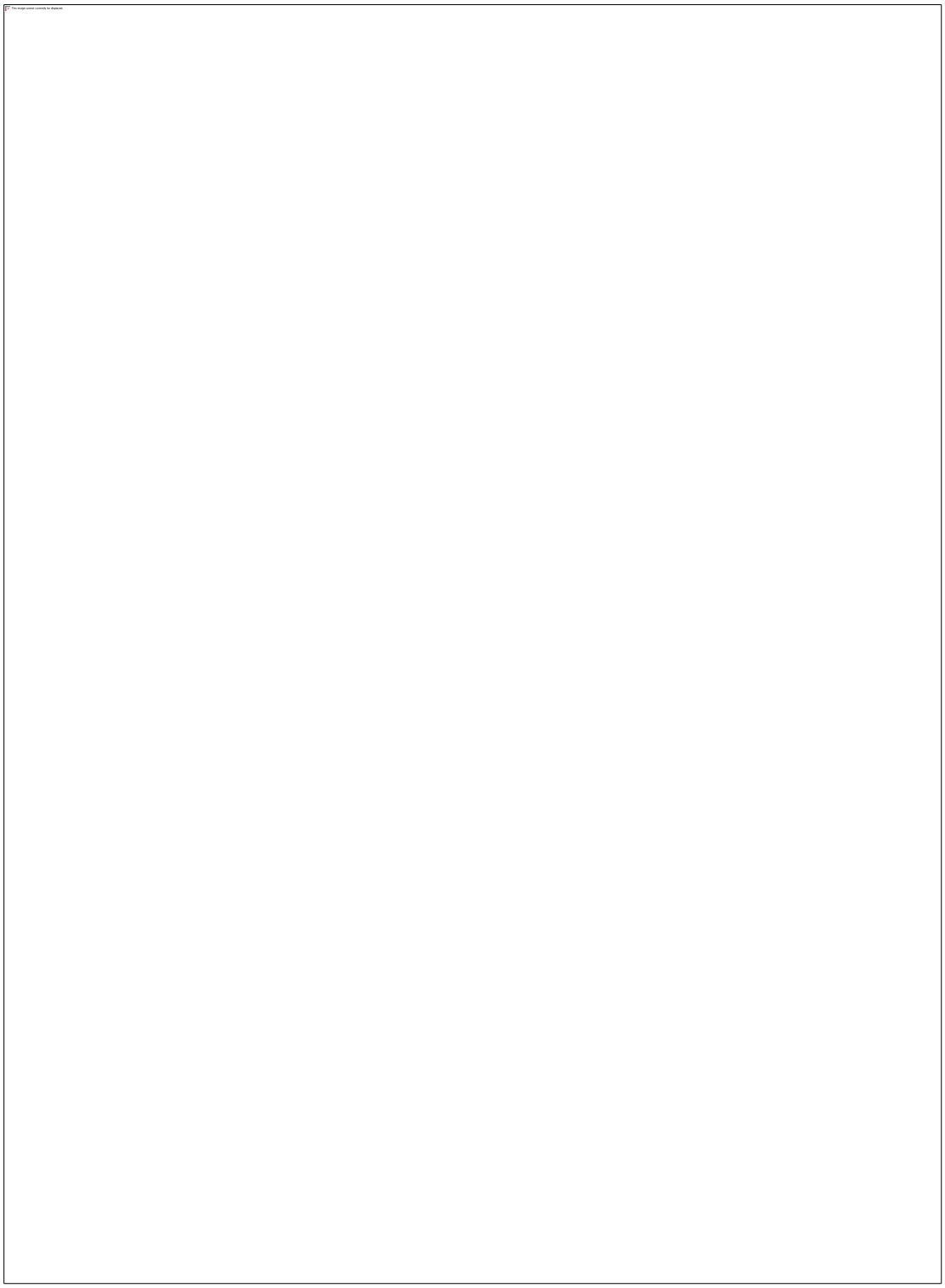
APPENDICES

APPENDIX A: Research Cover Letter



APPENDIX B: Research Permit Request for BHS Molyko

Date 09/11/2015

RESEARCH PERMIT REQUEST

Address to the principal of

Billingual Grammar School Molyko

(BHS)

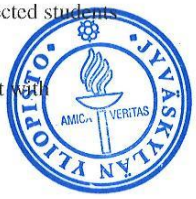
South West Region Cameroon

I am a student in the Master's Degree Programme in Educational Leadership, where I am writing my Master's thesis on the topic **The use of ICT in teaching and learning in Cameroonian secondary schools.**

The purpose of the study is to explore/find out how teachers and students in these schools use ICT as a pedagogical tool in teaching and learning to improve the educational outcome. This study also examines the leadership role in influencing the use of ICT in Cameroonian schools.

I am requesting for your kind permission to collect the research data in your institution from the 4th to the 20th of January 2016. The research data to be collected would consist of interview of the 5 teachers, the ICT support staff and the principal. Observation studies with the use of a video camera, and a focus group discussion with the selected students performing students

The data is collected and used for research purposes only and will be dealt with anonymously.



Mua Rodanny Kennah

Adress Taitoniekantie 9 B as 515
40740
Jyvaskyla
Finland
Tel. +358465716924
Email: murokenn@student.jyu.fi

APPENDIX C: Research Permit Request for GBHS Muea

RESEARCH PERMIT REQUEST

Address to the principal of

Government Billingual High school Muea

(GHS)

South West Region Cameroon

I am a student in the Master's Degree Programme in Educational Leadership, where I am writing my Master's thesis on the topic **The use of ICT in teaching and learning in Cameroonian secondary schools.**

The purpose of the study is to explore/find out how teachers and students in these schools use ICT as a pedagogical tool in teaching and learning to improve the educational outcome. This study also examines the leadership role in influencing the use of ICT in Cameroonian schools.

I am requesting for your kind permission to collect the research data in your institution from the 4th to the 20th of January 2016. The research data to be collected would consist of interview of the 5 teachers, the ICT support staff and the principal. Observation studies with the use of a video camera, and a focus group discussion with the selected students performing students

The data is collected and used for research purposes only and will be dealt with anonymously.

Mua Rodanny Kennah

Adress Taitoniekantie 9 B as 515
40740
Jyvaskyla

Appendix D: Interview Guide Outline for Teachers

Dear Respondent,

I am Mua Rodanny, a postgraduate researcher from the University of Jyväskylä, Finland, carrying out a research on ***"The Use of Information Technology in Teaching and Learning: A Case Study of Cameroonian Secondary Schools"*** I shall be grateful for your kind assistance and participation in making this task a success.

This study is strictly for academic purpose and will be treated with high degree of confidentiality.

1. <u>Exploring ICT Usage in Teaching</u>

1.1 Effective Teaching

- Can you describe in detail how you plan and select ICT tools to use in teaching? Which criteria do you use in selecting these tools?
- Do these ICT resources ensure effective teaching? Please can you elaborate more with an example?
- What problems do you face in using these ICT tools in your classroom?
- What do you suggest can be changed in this school so that teachers can effectively use ICT in delivering their lessons?
- Do your students have the skills to make effective use of ICT?

1.2 Teacher´s ICT Skills/Competency

- Have you undergone any professional ICT training before? If yes, can you describe the kind of training?
- Do you have sufficient knowledge to use ICT equipment and software effectively and efficiently?
- Is there any guideline or policy for teachers to use ICT in this school?
- Do you have a computer at home? How often do you use them and for what purpose?

- ✧ Does it make you a more knowledgeable teacher?
- ✧ Does it make you teaching more efficient?

1.3 Pedagogic Model

- Do you see the teaching of ICT as a subject or can it be effectively integrated in the teaching of other subjects? Can you give a reason for your answer?
- As a teacher, can you describe how one can use ICT as a pedagogic tool in teaching? Please illustrate with an example.

2. <u>Impact of ICT Usage</u>

2.1 Teaching Outcome

- ◆ From your experience as a teacher, has the use of ICT changed the way you teach your students? Can you explain the various outcomes of these changes?
- ◆ What importance do you place on ICT in the curriculum and in teaching?
- ◆ Is there any difference when using ICT in teaching as oppose to normal teaching without ICT? If yes, why do you say so?

2.2 Learning Outcome

- ✓ How has your use of ICT in teaching facilitated your student's ability in knowledge acquisition, use and understanding of your lessons?
- ✓ How can you recognise standards of attainment in your subject when ICT is used?

Appendix E: Interview Guide Outline for Principals

Dear Respondent,

I am Mua Rodanny, a postgraduate researcher from the University of Jyväskylä, Finland, carrying out a research on ***"The Use of Information Technology in Teaching and Learning: A Case Study of Cameroonian Secondary Schools"*** I shall be grateful for your kind assistance and participation in making this task a success.

This study is strictly for academic purpose and will be treated with high degree of confidentiality.

Role of School Administration

Role of Principal

- According to your experience as a principal, how can you define the concept of teaching and learning with ICT?
- Are there any programmes or projects set by the school administration to integrate ICT into the various subjects or curriculum individually? If yes, please can you explain that in detail?
- Has there been any training, workshop or seminar for the teachers since you took over as principal of the school?
- Do you think ICT is used properly as a pedagogic tool in the school? Can you explain that with an example?
- How can you describe the school curriculum with regards to pedagogy and ICT?

Appendix F: Interview Guide Outline for Parents

Dear Respondent,

I am Mua Rodanny, a postgraduate researcher from the University of Jyväskylä, Finland, carrying out a research on ***"The Use of Information Technology in Teaching and Learning: A Case Study of Cameroonian Secondary Schools"*** I shall be grateful for your kind assistance and participation in making this task a success.

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Role of Community (PTA Head)

- ✧ What do you think about teaching our children now with ICT?
- ✧ What is the situation of your child with respect to this?
- ✧ How do you help your child to meet up intellectually with the school ICT requirements?