UNIVERSITÉ DE YAOUNDÉ I

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CENTRE DE RECHERCHE ET DE FORMATION DOCTORALE EN « SCIENCES HUMAINES, SOCIALES ET EDUCATIVES »

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UNITE DE RECHERCHE ET DE FORMATION DOCTORALE EN SCIENCES DE L'EDUCATION ET INGENIERIE EDUCATIVE

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THE UNIVERSITY OF YAOUNDÉ I

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POSTGRADUATE SCHOOL FOR THE SOCIAL AND EDUCATIONAL SCIENCES

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DOCTORAL RESEARCH UNIT FOR EDUCATION SCIENCES AND EDUCATIONAL ENGINEERING

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PEDAGOGIC INTEGRATION OF ICT IN GOVERNMENT SECONDARY SCHOOLS IN YAOUNDE FIVE (V) AND BEHAVIOURAL CHANGE IN TEACHING-LEARNING ACTIVITY.

A dissertation submitted in partial fulfilment of the requirements for the award of Master Degree in Fundamental Studies in Education

Option: ICT and Education

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DEDICATION

To my husband, Ritzentelar Chinanga Akkum

And in loving memories of my Dad

Fanso Damasuis Wirba

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ABSTRACT

The introduction of information and communications technologies (ICT) in education reflects and responds to present and future needs of people functioning in an intensely changing and challenging intellectual environment. This study examines the extent to which the integration of ICT into Government Secondary schools in Yaounde 5 (V) municipality has brought about behavioural change in the teaching-learning activity. If ICT based education is a gateway to participation in future culture, society and economy, to what extend has it integration in the said schools brought about behavioural change in the teaching-learning activity? Changes brought by this ICT integration is seen at different levels including student, teacher and administration. ICT, when appropriately used, can serve as a vehicle and a platform for meaningful educational reform geared towards a shift from didactic "instructionism" to constructivism. However, our empirical evidence from three Government Secondary schools in Cameroon, reveal that the integration of ICT is made possible through necessary elements put in place to ease this integration, and that it is also necessary so as to train students with the competent skills of the 21st century learners, and finally it is thanks to this ICT integration that we observed Social, Cultural and Educational changes. Three specific hypotheses were formulated to guide our research work.

The study involved a mixed methodological approach (quantitative and qualitative). In respect to the quantitative approach, 300 questionnaires were distributed to students drawn from the three (3) Government Secondary Schools under Yaounde V municipality. On the other hand, the qualitative approach consisted of interviews and observations. A total of 20 persons from all the schools were interviewed. This comprised of – administrative staff, computer Science teachers, non-computer teachers and Monitors of the computer hall/Multimedia Resource Center (M.R.C). A Simple random sampling and systematic random techniques were applied where necessary so as to obtain the sample. Chi-squared test used to test the research hypotheses. All the interview data were all transcribed and interpreted using the participants' quotes as examples and evidence of the findings. Pictures were used to analyse observational data. It is therefore evident from this study that ICT integration has brought about behavioural change in the teaching-learning activity at the student, teacher and administrative related levels.

Keywords: ICT, ICT integration, access, Behavioural change, teaching-learning activity, Secondary schools, school system, Pedagogy

RESUME

L'introduction des technologies de l'information et de la communication dans l'éducation reflète et répond aux besoins actuels et futurs des personnes qui fonctionnent dans un environnement intellectuel intensément changeant et stimulant. Cette étude examine dans quelle mesure l'intégration des TIC dans les écoles publiques dans la municipalité de Yaoundé a entraîné des changements de comportement dans l'activité d'enseignement et d'apprentissage. Si l'éducation basée sur les TIC est une porte d'entrée à la participation à la culture, à la société et à l'économie de l'avenir, dans quelle mesure l'intégration dans les écoles a-t-elle entraîné des changements de comportement dans l'activité d'enseignement-apprentissage?

Les changements apportés par cette intégration des TIC se retrouvent à différents niveaux, y compris les étudiants, les enseignants et l'administration. Les TIC, lorsqu'elles sont utilisées de manière appropriée, peuvent servir de véhicule et une plate-forme pour une réforme éducative significative orientée vers un passage du «didactique» au «constructivisme». Cependant, nos preuves empiriques de trois écoles secondaires gouvernementales au Cameroun révèlent que l'intégration des TIC est rendue possible grâce aux éléments nécessaires pour faciliter cette intégration et que cela est également nécessaire pour former les étudiants ayant les compétences compétentes Apprenants du 21ème siècle, et enfin grâce à cette intégration des TIC que nous avons observé des changements sociaux, culturels et éducatifs. Trois hypothèses spécifiques ont été formulées pour guider nos travaux de recherche.

L'étude comportait une approche méthodologique mixte (quantitative et qualitative). En ce qui concerne l'approche quantitative, 300 questionnaires ont été distribués aux étudiants issus des trois écoles publiques dans la municipalité de Yaoundé V. D'autre part, l'approche qualitative comprenait des entrevues et des observations. Au total, 20 personnes de toutes les écoles ont été interrogées. Cela comprend: le personnel administratif, les professeurs d'informatique, les autres enseignants et les moniteurs de la salle informatique / Centre de ressources multimédia (M.R.C). Un échantillonnage aléatoire simple et des techniques aléatoires systématiques ont été appliqués si nécessaire afin d'obtenir l'échantillon. Le test de Chi-quadrillé utilisé pour tester les hypothèses de recherche. Toutes les données d'entrevue ont toutes été transcrites et interprétées en utilisant les citations des participants comme exemples et des preuves des résultats. Les images ont été utilisées pour analyser les données d'observation. Il ressort donc de cette étude que l'intégration des TIC a facilité le processus d'enseignement et d'apprentissage aux niveaux de l'apprentissage, l'enseignant et administration.

Mots-clés: TIC, intégration des TIC, accès, changement de comportement, activité d'enseignement-apprentissage, écoles secondaires, système scolaire, pédagogie

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LIST OF ACRONYMS

BBLMS	Blackboard Learning Management System
C.A.I	Computer-Assisted Instruction
CBA	Competency-Based Approach
CIAC	Computer and Internet Access Centres
CRM	Centre de Recherché Multimedia
EFA	Education For All
ERNWACA	Educational Research Network for West and Central Africa
G.B.H.S	Government Bilingual High School
G.H.S	Government Bilingual School
ICT	Information and Communication Technology
ICTs	Information and Communication Technologies
IICD	International Institute for Communication and Development
IT	Information Technology
Ita	Italian language
LCA	Learner-Centered Approach
MINESEC	Ministry of Secondary Education
MPTP	Multimedia Portable for Teachers Pilot
MRC	Multimedia Resource Centres
NCHE	National Commission on Higher Education
NEPAD	New Partnership for Africa Development
NEPAD	New Partnership for Africa Development
OBA	Objective-Based Approach
OERs	Open Educational Resources
OLPC	One Laptop Per Child
P.T.A	Parent Teachers Association
SBEPS	Special Bilingual Education Programs
SOL	Standards of Learning

SUMMARY OF CONTENTS

INTRODUCTION

REASONS FOR CHOICE OF TOPIC

The choice of this research topic is centred on the fact that Cameroon is making great progress regarding the use of Information and communication technologies (ICTs) in the various development sectors, including education. In effect, our decision to specialise in Information and Communications Technology in education has served as an eye opener for us to understand the necessity of integrating ICTs in education. Through this, we got to understand that Cameroon is one of the sub-Saharan African countries that is making huge advancement in the use of the Information and Communications Technologies (ICTs) in education. This is because it is believed that they contribute to the amelioration of the quality of education. Just like any other innovation, the integration of ICTs in Cameroon secondary schools welcomed many challenges which aroused our interest.

In the academic cycle, there is actually no research without motivation. As a 21st century teacher, we realised that the integration of ICTs in Cameroon education system more especially in secondary general and technical schools, is challenging in the teaching learning activities. Given the importance of ICTs in education, private schools in Cameroon deemed it necessary to introduce these technologies into their curricula in the 1990s and apply their own teaching method. This was because of the lack of specific policy guiding the teaching or use of ICTs in education. This stirred the interest of Cameroon government thus leading to the official introduction of information and communication technologies (ICTs) into her education system. This innovation officially took effect after President Paul Biya's message of February 10th 2001 to the Cameroonian youth. In République du Cameroun (2007c: 3), the President promised "the introduction and the generalisation of the learning of computing in schools, and the endowment of at least one computer room with access to the internet network"[21]. The youth were thus urged to embrace the knowledge economy .The impact of the President's promised was accelerated in 2002 with the introduction of ICT in secondary general and technical schools in Cameroon. Many schools have benefited from the presidential "gifts"[22] of multimedia centres connected to internet. Official programs of ICT were designed for secondary schools in 2003.

We observed that the Educational Research Network for West and Central African Countries (ERNWACA or ROCARE in French) recommends the integration of ICT in the teaching Learning process. ERNWACA-Cameroon was responsible for organizing a workshop on the integration of

[21] République du Cameroun, Stratégie nationale de développement des technologies de l'information et de la communication. Yaoundé, Cameroun, Agence de technologies de l'information (ANTIC), 2007c, p.3.www .observatoiretic.org/documents/show/87

[22] Ibid., 2007.

ICTs in schools and training institutes held in Yaoundé, Cameroon in December 2005[23]. A proper implementation of this ICT will no doubt lead to some moves from traditional pedagogical and administrative culture, from teacher centered pedagogies and memorization as a learning technique to a more constructivist, learner-centered approach, with learners assuming more responsibility. The use of ICT will therefore increase development of research and problem solving skills. Among the different technologies for information and communication, the computer and the internet represent privileged means of learning and teaching as they enhanced pedagogical practices and permits wide and rapid exposure to the world.

Given the importance associated with the said technologies, what actually caught our intuitive observation here was the continuous behavioural change in the teaching-learning activity in government secondary schools under Yaounde 5 municipality. This behavioural change which is still observed in targeted Cameroon secondary schools among the various actors concerned, is a call for concern since the application and the areas of implantation of ICTs are diverse and present in almost all spheres of human activity. This is because ICTs create an assembly of facilities used for the treatment, modification and exchange of information thus a social look into the behavioural change resulting from this innovation is imperative.

Moreover, the general objective to begin ICT as a discipline in secondary schools is to meet up with the goal to train students who will be professionals in Information and Communication Technology in future in order to change the socio-economic state to tie with globalization. ICT as a school subject will help students develop skills that will permit them at the end of their studies to be self-employed and easily integrated into the working population for better products. Consequently, we are interested to know whether the behavioural change experienced in government bilingual high school Yaounde will contribute in the realization of this said objective. More importantly because this objective is also confirmed by New Partnership for Africa Development (NEPAD) which recognizes that, the key issue in Africa is the development of human resources.

Furthermore, the great need for young Cameroonians aspiring to becoming teachers to acquire the necessary academic and professional skills, attitudes and values suitable for learning in the 21st century in the 21st century is another motivating factor. Also, the incessant love of electronic gadgets like computers, Internet, digital radios, digital Televisions and hand held devices like telephones by

[23] ERNWACA-Cameroon, Integrating ICT in Education in West and Central Africa, A Study of Pioneer Schools inCameroon,Yaoundé,Cameroon,ERNWACA-Cameroon, 2005www.rocare.org/Rapportfinal_TICICM2005.pdf.

Cameroonians motivated the researcher to carry out this study. Finally, the growing interest in the telecommunication sector by the Cameroon government and the mastering of the area of study by the researcher were additional motivating factors.

All the above mentioned detail gave us a go ahead as it also occurred to us that this research would increase the reservoir of knowledge in the University of Yaoundé I, in the Department of Science of Education and without.

PROBLEM

The integration of information and communication technologies (ICTs) in teaching has come to improved secondary education which is fundamental to the creation of effective human capital in any country. In Cameroon, we observed a rapid change in the role of teachers given the changing nature of the educational system and the entire society as a whole. The present 21st century period therefore explained the innovation witnessed by the Cameroon educational system. The use of ICT which trigger constructivist innovation in the classroom contributes to the realization of meaningful authentic, active-reflective and problem-based learning. This is a method that challenges students to "learn how to learn", seek solutions to real world problems, which, based on an ICT framework, are used to engage their curiosity and initiate learning thus leading so to critical and analytical thinking. There are thus observable numerous challenges in Cameroon educational system that comes with the integration of ICT. Even though teachers are faced with these challenges, they are required to adapt to them.

The present situation of our targeted population is peculiar given that the integration of ICT into this institution faced challenges related to behavioural changes. The on-going behavioural change which is tilted towards teachers' difficulties in teaching with ICTs as well as the misuse of technological tools for leisure time activities rather than realizing meaningful authentic, active-reflective and problem-based learning as postulated by the constructivists.

LITTERATURE REVIEW

The integration of Information and Communication Technology into any educational system is a topical issue in this our 21st century. ICTs in schools in industrialized countries were introduced around the 1980s. Yet, their use for educational purposes is still not evident to teachers thus making

it the subject of several studies[24]. This review of literature will focus on investigating research on teaching of ICT and the 21st-Century Learner, Exploring other views surrounding barriers of effective integration of ICTs into curriculum and other Related Literature.

Teaching of ICT and the 21st-century learner

It is the ability to apply learning in novel situations that makes for a successful student and, eventually, a successful member of the 21st-century workforce. Research has suggested that students learn more when engaged in meaningful, relevant, and intellectually stimulating work and that using technology increases the frequency for this type of learning[25]. Teaching that integrates ICT ensures students are actively engaged and allows them to practice their learning in novel situations by relating, experiencing, applying, cooperating, and transferring[26].

A study carried out by McCoog, stated that the three r's of education (reading, writing, and arithmetic) have been replaced with rigor, relevance, and real-world skills for the 21stcentury learner[27]. It is therefore imperative that teachers alter their instruction to focus on what their students need. To McCoog, it is not enough to simply teach in the same manner in which we were taught because the skills necessary for success in society have changed. In order for students to be competitive in the workforce they must possess 21st-century skills. These skills According to him, specifically include global awareness, scientific literacy, higher-order thinking and planning abilities, the ability to collaborate, and leadership abilities, where technology literacy is the foundation of all of these skills. He equally states that cultural awareness and social responsibility are also key components to the skills a student must possess given that much of their work will constitute communication on a global scale[28].

In their study involving middle school math students, , Bottge, Grant, Stephens, and Rueda observed that those who were taught the math curriculum utilizing technology performed better than their peers who were taught using a traditional approach to the same curriculum. The study employed a randomized pre-test and post-test comparison group design in which one group of middle school

[24] Bauer, J. et Kenton, J., Toward technology integration in the schools, *Why it isn't happening,* Journal of Technology and Teacher Education, 2005, pp.519-546

[25] Lambert, J., & Cuper, P., Multimedia technologies and familiar spaces, *21stcentury teaching for 21st-century learners, Contemporary Issues in Technology and Teacher Education,* 2008. http://www.citejoumal.org/vol8/iss3/currentpractice/article 1 .cfm

[26] Dyer, R. R., Reed, P. A., & Berry, R. Q., *Investigating the relationship between high school technology education and test scores for algebra I and geometry,* Journal of Technology Education, 2006, pp.7-17.

[27]McCoog, I. J., *21st century teaching and learning* [Online forum submission], 2008. http://Owww.eric.ed.gov.library .regent.edu/PDFS/ED502607.pdf

[28] *Op.cit., 2008*

students was taught the math curriculum in the traditional manner in which it is usually taught and the other group was taught the same curriculum utilizing ICT methods. The results of the criterion referenced tests indicated differences in the group's problem-solving abilities and computation skills with the group that was taught using ICT methods scoring higher in both areas than the group that was taught in the traditional manner[29].

Also, Lei studied how teachers used technology resources and found that social communication technology use had a significant positive association with student development and a moderate positive association with student achievement. It was even found that entertainment-exploration use of technology improved student learning habits[30]. Research has also suggested education that integrated technology had a positive effect on student achievement. Dyer et al., study in particular, sought to determine if students involved in an illustration and design technology course would perform better on the mathematics Standards of Learning (SOL) test, which is Virginia's standardized test. In this study, it was found that those students who participated in the illustration and design technology course had a statistically significant higher passing rate on the SOL than those students who did not participate in the technology course[31]. An increase in student achievement as indicated by improved test scores and an increase in student engagement was also found in another study where ICT was integrated throughout the science curriculum[32].

Another study collected and analysed data on 21 middle schools that had a laptop for every student and teacher and 21 other middle schools were used as the control group and not given laptops for every student and teacher. There was a positive effect on student technology proficiency and the frequency of technology-based classroom activities, and while there was no statistically significant effect on student reading or math achievement, the direction of predicted effects was consistently positive[33].

It is also suggested that merely utilizing technology as a learning tool on a regular basis does not automatically result in higher student achievement; rather, it is through high-quality and purposeful utilization of technology that students will perform better. Lei found out that when time spent using technology was the only factor analysed, there were no significant differences in student achievement. When general technology use was examined, as a factor, only technology proficiency increased while subject-specific technology use impeded technology proficiency[34]. Social

[29] Bottge et al., 2010
[30] Lei , 2010
[31] Dyer et al., 2006
[32] Chandra & Lloyd, 2008
[33] Shapley et al., 2011
[34] Lei , 2010

communication technology use, or ICT, had a significant positive association with student development and a moderate significant positive effect on student achievement. It is as well observed that students who learn in a technology-enhanced environment not only increase their motivation and achievement but also improve their self-efficacy levels[35]. Also, Hsieh et al. found that the sixth-grade students in their study had increased levels of self-efficacy as a result of working in a technology-enhanced learning environment. The students gained a deeper understanding of the concepts in their lessons by working collaboratively with their partners on meaningful activities that incorporated problem-solving strategies and self-directed learning skills in the technology-enhanced environment. The study's results suggest that direct, traditional instruction is not the only means of teaching and that the technological experience offers a nondirective method of teaching that utilizes collaboration and results in increased motivation, self-efficacy, and achievement[36]. Studies have shown that students with higher perceived self-efficacy are more persistent, motivated, and experience greater achievement[37]. The greatest catalyst for increasing self-efficacy in students is found in the self-directed learning that takes place when a student is using technology as a learning tool. Bandura Schunk found that when students pursued self-directed learning with proximal sub goals they achieved substantial mastery of mathematical operations and developed a strong sense of mathematical efficacy[38].

On the other hand, not all studies have found ICT as a catalyst for improved student achievement. Merrill for example, found no difference in student achievement for students taught using technology when compared with those students who were taught using traditional methods[39]. Other researchers have even suggested it is debatable that technology-infused teaching can enrich student learning and cautioned educators to plan purposefully and not assume student achievement is inevitable simply because technology is being used[40]. Schofield warned that the shift from a teacher-centered to a student-centered learning environment may have unanticipated consequences. For instance, it was found out in this studies that when teachers' goals were unaligned with the shift in classroom environment, any transformative effects that were anticipated to occur through the use of technology were greatly hindered[41]. With the use of technology comes the technical issue that sometimes arise and hinder proper facilitation of the lesson. Garthwait and Weller outlined the technical problems that arose in their study when the teacher (Susan) utilized technology in the lesson.

[35] Hsieh et al. , 2008
[36] Ibid
[37] Bandura, 1997
[38] Bandura Schunk, 1981
[39] Merrill, 2001
[40] Mathiasen, 2004
[41] Schofield, 1995

"One of the first laptop activities Susan planned was for students to practice scientific note-taking and upload their work to the school server. She saw this as an effective way to assess students' ability to select key points and to paraphrase. Much to her distress, only half of the students had been taught how to access the server, so Susan had to rededicate time to teaching the others … this inefficiency was frustrating"[42].

On their part, Roschelle et al. asserts that teachers' implementation of practices involving technology is the main cause for improved student performance. When teachers make a concerted effort to master the technology and utilize it purposefully it can facilitate accelerated assigning, collecting, analysing, and discussing of student work[43]. The benefits of using technology in the classroom are insurmountable, even with technical issues that sometimes interfere with the lesson.

Obstacles of effective integration of ICTs into curriculum

Numerous barriers impede successful integration of ICTs in teaching. In their work, Birch and Burnett were asked about their use of, and attitudes toward educational technology and what they perceived to be the motivations, enablers and inhibitors associated with the development of e-learning environments. Consequently, the institutional barriers identified here are a lack of academic leadership, clear vision and formal strategic planning, and the absence of clear institutional policies, processes and standards. Individual barriers uncovered are time and heavy workload on lecturers while pedagogical barriers are lack of well-fitted course designs[44]. These authors indicate that interviewees complained of a lack of clear e-learning course design, strategic plans, policies, procedures, and processes. Looking at this study critically, one sees that it brings out the barriers of ICTs in teaching in an e-learning setting[45]. The study is however, not explicit in explanation of the issues raised or asked to their respondents. Views and perceptions are not actually clearly brought here. Secondly, from the look of things one is tempted to believe that study knew the results of this topic before carrying out investigation. The reason here is the pre-selection of the types of respondents for example adopters, non-adopters and pioneers. There are ICTs users who may not necessarily be in the school setting, but at home or different places or instructions.

[42] Garthwait and Weller, p. 369, 2005
[43] Roschelle et al., 2004
[44] Birch and Burnett, 2009
[45] Ibid, 2009

Moreover, in 1999, the United Nations Economic Commission for Africa held the first Africa Economic Forum under the theme Challenge to Africa of Globalisation and the Information Age. It realised that the continent's higher education institutions were plagued by external, internal and human obstacles to the integration of ICTs in education. External obstacles were: poor national telecommunication infrastructures, high costs of ICTs and higher import tariffs, inadequate and irregular ICT provision, and funding initiatives, absence of well-defined national ICT policy documents, unreliable electricity and limited Internet bandwidth, high license fees for new entrants, slow licensing procedures and high call charges. The internal obstacles were poor self-organisation

awareness and response to change as well as poor maintenance. As for human obstacles, we have lack of training and human support staff, lack of ICT systematic plans for integration in teaching and institutions' inability to retain experts due to low pay packages. This commission however, concentrated only in some countries and there is need for a wider observation.

Fulton et al. looked at teacher education and planning guide and proposed that even though ICTs can be powerful tools in students learning, their value depends on teachers in fusing them to support instructions. Without a strong foundation in the knowledge and skills for using technology effectively, teacher candidates entering today's schools will fall short of meeting the "highly qualified teacher" expectations set out by the No Child Left Behind (NCLB)[26]. It also reiterated that it is important for leadership to make it compulsory for new teachers to graduate from teacher programmes with ICT knowledge and skills so that they will be able to integrate technology easily and effectively into their daily teaching, where they may find themselves. However, even with such compulsory employment requirement, those recruited must have to update themselves with the new powerful and complicated ICTs. These types of preconditions for recruitment of faculty is only possible in developed country context where the ICTs are available and accessible, are taught and students are being taught using them. In order to affirm this, several studies need to be considered in different places, including the attitudes of faculty in integrating the devices in teaching in different settings. In third world countries, it is possible for a teacher to go through his/her training course without using or being taught using ICTs. So the precondition set above may not be a right one.

Barry et al. conducted a similar study on the underutilization of ICT-assisted

[26] Fulton et al., *Teacher Education and Technology Planning Guide, Learning Point Associates,* 1120 East Diehl Road, Suite 200, Naperville, 1L 60563-1486-800-356-2735. 630-649-6500, 2004.

collaborative project-based learning among international educators in Eastern Europe, Africa and North America and identified several barriers[27]. These were miscellaneous, lack of ICT-related projects, lack of ICT support, unreliable Internet connections, lack of teacher training, nature of curriculum and programs and lack of ICT technical support. This study showed that lack of training and high cost of Internet connections were the main inhibiting barriers in Africa, while the other factors were slightly significant in all these cases.

In a study commissioned by the Dutch Ministry of Education, Culture and Science in 1998 on the use of ICTs in higher education in The Netherlands, UK, Finland, Belgium,

Australia and USA, Wende and Beerkens stated that it is good to ask "What is the situation in our own country as compared to that of another country"[28]. The study found out that most higher education institutions in Europe do not yet have an elaborate and coherent institutional policy concerning the role and use of ICTs in higher education. Policies according Wende and Beerkens, are needed in universities and other higher education institutions today for the positioning of universities in the marketplace, to accelerate growth in demand by students and staff for access to educational technologies, to increase the acceptance of learner-centred (self-pace, self-directed) and more social interaction and communication settings and to improve efficiency/effectiveness of students. This study is in common with Oliver's view that the cost of technology- related programs is so high and that many in the academia are stili reluctant to use ICTs in teaching, due to lack of knowledge and skills[29].

Cross and Adam equally realised that even though South Africa has gone a long way in adopting an exemplary approach to adoption of ICTs in schools, it lacks a national policy framework concerning the role of ICTs higher education[30]. Apart from the effects of lack of clearly defined ICTs policy document and instruments, local contextual complexities also hinder their integration in higher education institutions. While the literature indicates that policy and implementation trends throughout the world tend to respond to global drivers (knowledge economy and ICT) at the expense of national and institutional interests, the South African

[27]Kramer Barry S. et al., The underutilization of information and communication technology-assisted collaborative project-based learning among international educators, A Delphi study, Utah State University, 2007.
[28] Marijk van der Wende and Eric Beerkens, An international orientation on institutional strategies and governmental policies for the use of ICT in higher education, Centre for Higher Education Policy Studies (CEIEPS), University of Twente, Netherlands, Vol.7, 1999.
[29]01iver Ron, The Role of Information and communication Technologies in Higher education for the 21st Century, Information and Communication Technologies as a Change agent for Education, 2003.
[30] Cross Michael and Adam Fatima, *ICT Policies and Strategies in Higher Education in South Africa,* National and Institutional Pathways, Higher Education Policy, 2007, pp.73-95.

experience shows how South African institutions have responded to these drivers reflecting local contextual complexities. They also noticed that after Apartheid in South Africa in the 1990s, the National Commission on Higher Education (NCHE) issued out a number of reforms to readjust higher education system to suit equal access and equity. The place of ICTs here was blurredly defined given "... no reference is made about the use of ICTs as a possible resource to expand access and analysis of key policy... ICT policy in higher education does not have the same thrust"[31]. The document however, alerts that the importance of ICT in higher education presents opportunities and threats depending on the views of policy makers. This is similar to what Wende and Beerkens realised in the West[32].

[31] Ibid., 2007, pp.73-95.
[32] Ibid., 1999.

Australia and USA, Wende and Beerkens stated that it is good to ask "What is the situation in our own country as compared to that of another country"[33]. The study found out that most higher education institutions in Europe do not yet have an elaborate and coherent institutional policy concerning the role and use of ICTs in higher education. Policies according Wende and Beerkens, are needed in universities and other higher education institutions today for the positioning of universities in the marketplace, to accelerate growth in demand by students and staff for access to educational technologies, to increase the acceptance of learner-centred (self-pace, self-directed) and more social interaction and communication settings and to improve efficiency/effectiveness of students. This study is in common with Oliver's view that the cost of technology- related programs is so high and that many in the academia are still reluctant to use ICTs in teaching, due to lack of knowledge and skills[34] [35].

Cross and Adam equally realised that even though South Africa has gone a long way in adopting an exemplary approach to adoption of ICTs in schools, it lacks a national policy framework concerning the role of ICTs higher education[23]. Apart from the effects of lack of clearly defined ICTs policy document and instruments, local contextual complexities also hinder their integration in higher education institutions. While the literature indicates that policy and implementation trends throughout the world tend to respond to global drivers (knowledge economy and 1CT) at the expense of national and institutional interests, the South African experience shows how South African institutions have responded to these drivers reflecting local contextual complexities. They also noticed that after Apartheid in South Africa in the 1990s, the National Commission on Higher Education (NCHE) issued out a number of reforms to readjust higher education system to suit equal access and equity. The place of ICTs here was blurredly defined given "... no reference is made about the use of ICTs as a possible resource to expand access and analysis of key policy... ICT policy in higher education does not have the same thrust"[36]. The document however, alerts that the importance of ICT in higher education presents opportunities and threats depending on the views of policy makers. This is similar to what Wende and Beerkens realised in the West[37].

[33] Marijk van der Wende and Eric Beerkens, An international orientation on institutional strategies and governmental policies for the use of ICT in higher education, Centre for Higher Education Policy Studies (CHEPS), University of Twente, Netherlands, Vol.7, 1999.
[34]01iver Ron, The Role of Information and communication Technologies in Higher education for the 21st Century, Information and Communication Technologies as a Change agent for Education, 2003.
[35] Cross Michael and Adam Fatima, *ICT Policies and Strategies in Higher Education in South Africa,* National and Institutional Pathways, Higher Education Policy, 2007, pp.73-95.
[36] Ibid., 2007, pp.73-95.
[37] Ibid., 1999.

Impact of the pedagogic use of ICT

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[28]. According to Kozma. R., et ah, 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.

After the introduction of this programme, a three-year assessment of the World Link research on the Programme with the use of multiple sources within an evaluative period 1999 and 2000 was conducted. 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[29]. Kozma et al. 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.

Fisher, Higgins, and Loveless, 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 in 1998. 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 [30]. The main aim of the programme was to increase teachers' confidence and competence in using ICT pedagogically. After the MPTP project, 98% of teachers who participated in the project made effective use of ICT in the teaching and the learning process[38]. Self-confidence and competence increase

[38] Ibid., 2006.

[28] Kozma, R., et al., *Closing the Digital Divide: Evaluation of the World Units Program,* International Journal of Educational Development, For "in press" format, 2004. vvww.robertkozma.com/images/kozma_closing_ijed.pdf

[29] Ibid., 2004.

[30] Fisher, T. et al., Teachers Learning with Digital Technologies, *A Review of Research and Projects,* Futurelab Report Series No. 14, Bristol, Futurelab, 2006.

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.

According to the IICD, 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[39]. 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 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 lICD-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 noticed that awareness and empowerment on ICT use had a great high score amongst the students and teachers. The various projects also showed that the many ICT projects carried out to integrate ICT in these schools in developing countries have made a positive impact towards the EFA universal goals for education access.

Furthermore, Zhao and Cziko 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[40]. They 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.

Mishra and Koehler on the part affirmed 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[41]. To them, for computers to have a significant impact on the teaching and learning process, it has to be integrated into the curriculum as a tool that can support the learning of other disciplines. To bring this change, both in-service and pre-service programmes need to be effectively organised for teachers to be equipped with

[39] IICD. International Institute for Communication and development, *ICTs for Education, Impact and Lessons Learned from IICD-Supported Activities,* The Hague, IICD, 2007.
[40] Zhao, Y. & Cziko, G.A., *Teacher adoption of technology, A perceptual control theory perspective,* Journal of Technology and Teacher Education, 2001, p. 5-30.
[41] Mishra, P., & Koehler, M. *).*, Technological pedagogical content knowledge, A framework for teacher knowledge, Teacher College Record, 2006.

required skills needed to incorporate 1CT in their classrooms.

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. The incorporation of ICT in the teaching and learning processes is still a major problem faced by teachers[33]. 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[42] [43]. Agyei and Voogt affirmed 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[44]. After examining pre-service training programmes in Norway, Almas and Krumsvik concluded that teachers have continued to reproduce an existing pattern of schooling based on teacher-centered approach and interaction. 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 then- day to day classroom practices. Nkwenti 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[45].

A study by Cuban 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

[42] Kozma, R., McGhee, R., Quellmalz, E., & Zalles, D., *Closing the Digital Divide, Evaluation of the H'orld Links Program*, International Journal of Educational Development, For "in press" format, 2004. wwvv.robertkozma.com/images/kozma_closing_ijed.pdf

[43] Voogt, J., & Tondeur, J., Towards design-based approaches for ICT integration in African education, Technology, Pedagogy and Education, 2015.

[44] Agyei, D. D., & Voogt, J., Developing Technological Pedagogical Content Knowledge in pre-service mathematics teachers, through Teacher Design Teams, Australasian Journal of Educational Technology, 2012, pp. 547-564.

[45] Nkwenti, M., ICT Integration in Cameroon Primary Schools, A Case Study of Government Primary Practicing School Angele, South Region, Master's Dissertation, Kuala Lumpur, Open University Malaysia, 2010.

documents[46]. 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[47]. 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[48]. This has affected teachers in this 21st-century thinkers as they now see ICT in teaching as an "add-on rather than a pedagogic tool in classroom teaching"[49]. Cuban further explained that most of the software applications used in schools like spread sheets and databases were created for a business purpose and not for education. 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[50].

A review by Chigona and Chigona, on 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[51]. From this study, 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 thus making good use of the ICT tools and resource available. Analyses of Chigona and Chigona revealed 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 due to personal, social and environmental factors.

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[52]. Focusing

[46] Cuban, L., Oversold and underused, Computers in the classroom, Cambridge, Mass, Harvard University Press, 2001.
[47] Agyei, D. D. & Voogt, J., Exploring the potential of the will, skill, tool model in Ghana, Predicting prospective and practicing teachers' use of technology, Computers & Education, 2011.
[48] Shulman, L. S., Those who understand, Knowledge growth in teaching, Educational Researcher, 1986.
[49] Ibid., 2001, p. 164.
[50] Pelgrum, W. J., Obstacles to the integration of ICT in education, Results from a worldwide educational assessment, Computers and Education, 2001.
[51] Chigona, A., & Chigona, W., An investigation of factors affecting the use of ICT for teaching in the Western Cape schools, 1*8th European Conference on Information Systems*, 2010.
[52] Ndibalema, P., *Teachers'Attitudes towards the Use of Information Communication Technology (ICT) as a Pedagogical Tool in Secondary Schools in Tanzania, The Case of Kondoa District*, International Journal of Education and Research, 2(2), pp. 1-16, 2014.

on the learner outcome in the use of these tools, De Witte Uaelermans, and Rogge, carried

out a learner outcome research of the utilisation of 1CT using the Trend in Mathematics and Science Study (T1MSS) in 2011. 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[53]. They 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.

The influence of modern technology on the learning environment

According to Noe the internet is primarily responsible for creating our revolution on learning[54]. Internet technology has permitted the development of electronic networks that integrate voice, video, and data connections among learners, instructors and experts. Halimi remarks that the Internet has had a major impact on the learning environment. She argues that with the mass of information available on Web, teachers have to acquire a new skill, that of guiding students to learn how to learn[55]. Nevertheless, Glickman states that research findings on the effectiveness of schools show that most schools simply do not make much difference in their students' lives. He also argues that "effective schools have faculties with a clear, collective purpose toward which they work"[56].

In addition, Bezuidenhout points out that in teaching large classes in a conventional set up, the educationally beneficial informal interaction between students and between lecturers and students is generally reduced, while effective use of both students and lecturer's time is often a challenge[57]. Sun, Shirley and Liu also share the view that in the traditional classroom, students learned to depend on tutors for their motivation, direction, goal setting, progress monitoring, self-assessment, and achievement[58]. However,

[53] De Witte, K., Haelermans, C. and Rogge, N., The effectiveness of a computer-assisted math learning program, Journal of Computer Assisted Learning, 2015.
[54] Noe, R., Employee Training and Development, 2nd edition, McGraw-Hill, New York, 2002.
[55] Halimi, S., Lifelong learning for equity and social cohesion, a new challenge for higher education, In C. McIntosh (Ed) *Perspectives on Distance Education, Lifelong Learning and Distance Higher Education*, UNESCO/COL, 2005.
[56] Glickman, C. D., Supervision of Instruction, A developmental Approach, Allyn and Bacon, Inc. Boston London Sydney Toronto, 1985, p.6.
[57] Bezuidenhout, L. P., Creating a Virtual Classroom, Using Forums to increase Teaching and Learning Activities, eLearning Africa 2009, 4th International conference on ICT for Development, Education and Training, 1CWE GmbH, 2009.
[58] Sun, L, Shirley, W. and Lui, K., Knowledge construction in e-Learning: Designing an e-learning environment,

technology has allowed learning to become a major dynamic process. Palloff and Pratt concludes that interaction in all its forms (between and among learners, learners and educators, learners and information on

content) is an essential element in the learning process[59]. The use of new technologies thus increases the capacity for new and better ways of knowledge sharing and teamwork.

According to Gurtas, students need to develop 21st century skills today in order to be able to become tomorrow's innovators[60]. They must use those skills to work their Way up the knowledge chain. This also provides the ground work for lifelong learning. Also, in a survey of eight secondary schools in Cameroon to better understand how the nature of the conditions in the integration of African countries, favour the successful integration of information and communication technology in the school system and to ensure quality education, Tchombe in Fonkoua concludes that the "...integration of ICT has Had a motivating effect on students as evident in the responses obtained from principals, students, teachers and parents"[61]. For example, the principals made reference to the influx of students during the hours of use and other hours. They also mentioned the fact that computer excited the students and generated more interest in school among them; the cyber café attendance and afternoon computer classes were evidence of this interest. Also, reduced absenteeism demonstrated the positive effect of the integration of ICT as a result of the manifested interest of the students. More still, 71% of the students: boys (38%) and girls (33%) affirmed that ICT greatly facilitates the production of schoolwork. Also, 80% of the teachers contended that the students focus more on learning task when working with the computer. Parents interviewed mentioned that their children talk about the computer and Internet and they find that they were very interested"[62] Notwithstanding, Mbangwana and Mambeh carried out a survey on "Cameroon Slate University students and teachers' instructional use of ICT".[63] The study, showed that students frequently use computer and Internet based resourced for instruction more than teachers: Z- calculated (9.78) and Z-

2003. (Online), Available: http://www.ais.reading.ac.uk/papers/con-knowledge%20construction%20in%20eLearning2003.pdf.

[59] Palloff, R. and Pratt, K., Building Learning Communities in Cyberspace, Jossey-Bass, San Francisco, 1999.

[60] Gurtas, F., Building capacity and competencies for the African Innovation Economy, eLearning Africa 2009, 4th International conference on ICT for Development, Education and Training, 1CWE GmbH, 2009, pp. 6-8.

[61] Tchombe, T.M.S., Integration of ICT in Education in Cameroon, In P. Fonkoua (Dir.), Intégration des Tic dans le processus enseignement-apprentissage au Cameroun, Yaounde, Cameroun, Editions Terroirs, ROCARE- Cameroun, 2006, p. 40.

[62] Ibid., 2006.

[63] Mbangwana, M.A., Introduction of ICT in Schools and Classrooms in Cameroon, In K. Toure, T.M.S. Tchombe, & T. Karsenti (Eds.), *ICT and Changing Mindsets in Education*, Bamenda, Cameroon: Langaa; Bamako, Mali: ERNWACA / ROCARE, 2008.

critical (1.645). Also that students are more confident and knowledgeable about the instructional use of computer and Internet than their teachers: Z - calculated (0.775) and Z - critical (1.645)[64].

Furthermore, a survey of traditional distance learning students at Makerere University indicate that there was good learner-learner and learner-lecturer collaboration through either electronic or non-electronic media[65]. Electronic communication employed e-mail, cell phones, and the discussion board. Fifty two percent (52%) of the learners confessed having received updates on the IT II course from their course leaders during residential sessions. 88% had an e-mail address prior to the commencement of IT II online course. Sixty four percent (64%) sent at least one email to their classmates, while 62% sent to their lecturer. The mobile phone was used for learner-learner collaboration by (38%) of the learners while the discussion board was used by 42% of the learners to discuss topical issues posted in the BLMS by the lecturer or learners. There was constructivist learning. Muyinda, et at. also revealed that learners (81%) concurred that the face to face tutorial and the one page step by step guideline on how. to use the BBLMS (Blackboard Learning Management System) were sufficient to let them participate in online learning.

Going back to our research topic, we see that the above literature failed to deeply analyse the behavioural change in the teaching-learning activity that resulted from the integration of ICT in Government Secondary Schools in Yaounde V which is our main focus. We will therefore tease out the available ICT tools, how they are used, the importance and impacts of integrating ICT into the curriculum of the said institutions.

IV. STATEMENT OF THE RESEARCH PROBLEM

The integration of ICTs in teaching has come to improved secondary education which is fundamental to the creation of effective human capital in any country. This integration reflects and responds to present and future needs of people functioning in an intensely changing and challenging intellectual environment such as Cameroon. According to Mbangwana, the right used of these technologies will results to a significant educational improvement[66]. To him, ICTs

[64] Ibid, 2008.
[65] Muyinda, P. B., and Jude, T., Lynch, K., *A model for Scaffolding Traditional Distance Learners in Africa for Construclivistic Online Learning, eLearning Africa 2009*, 4th International conference on ICT for Development, Education and Training, ICWE GmbH, 2009, p. 32.
[66] Mbangwana, M.A., Introduction of ICT in Schools and Classrooms in Cameroon, In K. Toure, T.M.S. Tchombe, &

when appropriately used, can serve as a vehicle and a platform for meaningful educational reform geared towards a shift from didactic "instructionism" to constructivism. Its integration is therefore a topical issue in education.

From our observation, the integration of ICTs into Cameroon educational system is facing some challenges just like any other innovation. This is seen in the behavioural changes in the teaching-learning activity because teachers have to deal not only with new methods of teaching and learning and an increase in the number of students but most importantly with an explosion in the development of teaching with ICTs. Learners on their parts tend to misuse the technology for leisure time activities thereby jeopardizing their time to learn and study as seen in Yousefs and Dahmani's work. They described online gaming; use of face book, chat rooms, and other communication channels as perceived drawbacks of ICT use in education, because students easily switch to these sites at the expense of their study[67]. The immature brains of these learners finds it challenging to deal with these technological tools. Also, the hijh cost of the technology and maintenance of the facilities, virus attack of software and the computer, interruptions of internet connections, are among the technology related challenges of ICT use in Cameroon educational system. Despite .the expected advantages to be enjoyed with the implementation or integrating of ICTs into the Cameroon educational system, Cameroon is still facing some challenges which limits these benefits.

Teachers are faced with challenges given the role they play in the teaching-learning process using computers and internet connections. Although teachers' attitude towards use of these technologies is vital, many observations reveal that teachers do not have clarity about how far technology can be beneficial for the enhancement of learning. Some teachers may have positive attitudes to the technology, but refrain from using it in teaching due to low self-efficacy, tendency to consider themselves not qualified to teach with technology. In this respect, Bandura describes self-efficacy as "individual's opinion of capabilities to organize and perform courses of actions to achieve particular types of performances"[68]. As identified by Brosnan, attitude, motivation, computer anxiety, and computer self-efficacy are factors affecting teachers' use of computers in their lessons. Teacher resistance and lack of enthusiasm to use

T. Karsenti (Eds.), *ICT and Changing Mindsets in Education*, Bamenda, Cameroon: Langaa; Bamako, Mali: ERNWACA / ROCARE, 2008.

[67] Yousef, A. B. and Dahamini, M., The Economics of E- Learning, The Impact of ICT on Studenl Performance in Higher Education: Direct Effects, Indirect Effects and Organizational Change, 2008. http://rusc.uoc.edu.

[68] Bandura, A., Self-Efficacy, Social Foundations of Thought and Action, *A Social Cognitive Theory*, Englewood Cliffs, NJ, Prentice-Hall, 1986.

ICT in education may also be a problem. The lack of required skills from teachers makes them uncomfortable since they do not have trainings needed to use the technology in their teaching. Unless teachers develop some basic skills and willingness to experiment with students, ICT use in education is in a disadvantage[69].

On the other hand, students are also faced with some challenges in the use of ICT. Appropriate use of computer and the internet by students have significant positive effects on their attitude and achievement. Nonetheless, we observe that these students tend to misuse the technology for leisure time activities thus jeopardizing their time to learn and study. Internet access at home, for instance, may be a distraction because of chat rooms and online games, reducing the time spent in doing assignments and learning[70]. Therefore, the impact of availability of ICT on student learning strongly depends on its specific uses. The inappropriate use of ICT tools is disadvantageous in education and so students need to be control from websites unrelated to the learning content.

Moreover, we equally have technological related challenges of ICT in Cameroon education. The high cost of the technology and maintenance of the facilities, high cost of spareyiarts, virus attack of software and the computer, interruptions of internet connections, and poor supply of electric power are among the technology related challenges of ICT use in educational system of Cameroon.

It is also noticed that learning content and language challenge the integration of ICT in education as well. Content development is a critical area that educators overlook. In integrating ICT in education, we have to care for the relevance of the learning content to the target groups. With respect to language, English is the dominant language in many of educational software, while English language proficiency is not high in many of the developing countries which Cameroon is not exempted. This is therefore a barrier in the integration of ICT to education.

Despite the expected advantages of integrating ICTs in secondary education in Africa as a whole, ICTs remain a low policy or financial priority in most educational systems in Africa. Obviously, African countries lack the local capacity and financial ability essential for a sustainable integration of ICTs in education. Understandably, African countries face numerous

[69] Brosnan, T., Teaching Using ICT, University of London, Institute of Education, 2001.
[70] Kulik, J.A., Meta-analytic studies of findings on computer-based instruction, in J.E.L.Baker & H.F.O'Neil (Ed.), *Technology Assessment in Education and Training,* Hillsdale, NJ, Lawrence Erlbaum, 1994.

competing development priorities which strive for the attention of local policy makers. Although ICTs play a vital role in development, a couple of countries in Africa including Cameroon have established a comprehensive policy for the integration of ICT in education. Where such policies exist, they tend to remain vague and make little reference to implementation[71]. As Tina James aptly opined, ICT in education policy needs to establish itself within the set of competing priorities. However, given the urgency of educational needs, particularly at the secondary school level, the establishment of such policy domain is overdue.

Nowadays, education is no longer seen simply as the result of a transmission of knowledge. Pedagogical strategies employed in the current ICT-based learning are linked to Piaget's constructivism paradigm which has had wide ranging impact on learning theories and teaching methods in education which is an underlying theme of many education reform movements. According to this theory, knowledge is considered to be socially and individually constructed through interactive learning, building on what the student already know. In this case, the use of ICT can trigger constructivist innovation in the classroom contributing to the realization of meaningful authentic, active-reflective and problem-based learning. This is a method that challenges students to "learn how to learn"[72], seek solutions to real world problems, which, based on an ICT framework, are used to engage their curiosity and initiate learning thus leading so to critical and analytical thinking.

On the contrary, the integration of ICT into Government Secondary Schools in Yaounde V is challenging such that the on-going behavioural change is tilted towards teachers' difficulties in teaching with ICTs and the misuse of these technological tools for leisure time activities instead of realizing meaningful authentic, active-reflective and problem-based learning as postulated by the constructivists. The present situation in the said Government Secondary schools thus demands in-depth investigation for elaborate analysis which will be exposed through the following research question:

PRINCIPAL RESEARCH QUESTION

- To what extent has the integration of ICTs into Government Secondary schools in Yaounde V brought about behavioural change in the teaching-learning activity?

This research work equally gives us the opportunity to ask the following questions as well:

[71] James, T. ed., An Information Policy Handbook for Southern Africa, A Knowledge Base for Decision- Makers, Johannesburg, International Development Research Center's (IDRC) Regional Office for Southern Africa, 2001.
[72] Op.cit

SECONDARY QUESTIONS

- How is ICT implemented in Government Secondary schools in Yaounde V?
- Why is the integration of ICT necessary in Government Secondary schools?
- What are the outcomes of the implementation of ICT in Government Secondary schools in Yaounde V?

GENERAL HYPOTHESIS

- The integration of ICTs into Government Secondary schools in Yaounde V has brought about behavioural change in the teaching-learning activity at the student, teacher and administrative related levels.

SECONDARY HYPOTHESIS

- ICT is implemented in Government Secondary schools in Yaounde V through necessary elements put in place to facilitate the integration of this innovation.
- The integration of ICT is necessary so as to train students with the competent skills of the 21st century learners.
- The integration of ICT has brought about Social, Cultural and Educational changes

THE THEORITICAL FRAMEWORK

In a more simple term, a theory is a formal statement of the rules on which a subject of study is based. According Kilminster a theory is "…an organising framework concepts, established by empirical evidence, which explains why society or some aspects of society works as it does. It also makes connections between aspects of society which would otherwise seem to be unconnected, thereby enabling us to organise a good deal of desperate empirical knowledge"[73]. We therefore need to use a theory or theories in order to best explain this research work thus making it more pertinent.

The following theories will be used:

- Theory of Behaviourism
- Theory of Constructivism
- Social Learning Theory

[73] Kilminster 1992:139

THEORY OF BEHAVIOURISM

Behaviourism is an approach to psychology based on the proposition that behaviour can be researched scientifically without recourse to inner mental states. It is more concerned with behaviour than with thinking, feeling, or knowing as it focuses on the objective and observable components of behaviour. It is a form of materialism, denying any independent significance for mind. One of the assumptions of behaviourist thought is that free will is illusory, and that all behaviour is determined by the environment either through association or reinforcement. Leading developers of behaviourism includes C. Lloyd Morgan (British ethnologist and psychologist), Ivan Pavlov (Russian physiologist), and some American psychologists including Edward Thorndike, John B. Watson, Edward C. Tolman, and Clark L. Hull. The behaviourist school of thought ran concurrent with the psychoanalysis movement in psychology in the 20th century with Ivan Pavlov, who investigated classical conditioning, John B. Watson who rejected introspective methods and sought to restrict psychology to experimental laboratory methods, B.F. Skinner who sought to give ethical grounding to behaviourism relating it to pragmatism.

This theory originated with the work of John B. Watson who held the view that psychology should only concern itself with the study of behaviour. He considered it paramount that men could be studied objectively, like rats and apes and his work was based on Ivan Pavlov's experiments and classical conditioning. Today, behaviourism is associated with the name of B.F. Skinner, who made his reputation by testing Watson's theories in the laboratory. Skinner ultimately rejected Watson's idea since he believed that people respond to their environment, but they also operate on the environment to produce certain consequences.

According to Passer and Smith, B. F Skinner (1904–1990) believed that "the power of the environment could be harnessed for good or evil"[74]. On his part, Diessner postulates that Skinner is the most influential psychologists of the behaviourist movement of the 20th century[75]. Behaviourists see learning as a change in observable behaviour caused by external stimuli in the environment. They contend that it is the observable behaviour of the learner that shows whether he has learned something and not what is going on in his mind. However, B.F. Skinner's theory also serve as the basis for a variety of applications to human behaviour. He uses the phrase "Operant conditioning" to describe a type of learning in which the emitted (operant) rather than the elicited behaviour of the learner is manipulated. The concern of Behaviourism is therefore observable indicators that learning is taking place**.**

[74] Passer and Smith, p.22, 2001
[75] Diessner, p.134, 2008

More still, Skinner believed that children could be conditioned to acquire desirable skills and behaviours[76]. Skinner is remembered for his contribution in establishing a technology of teaching (teaching machine), a device that used his principles of step-by-step instruction and rewarding students' responses. This approach laid the foundation for the later development of behaviour modification, programmed instruction, mastery learning, direct strategies and other computer assisted instruction. Santrock also comment that by breaking down learning into small, simple steps and rewarding children after the completion of each step, learning mastery is achieved. Also, by combining many of these steps, complex behaviours can be learned efficiently. Moreover, Skinner proposes that instead of aversive control or punishment, teachers should use positive reinforcement, together with "attractive and attention compelling"[77] approaches to teaching.

Contrasting this view of learning is the emphasis of cognitive psychologists who equate learning with the mental processes of the mind. Learning according to J. B Watson (the father of Behaviourism), is a sequence of stimulus and response actions in observable cause and effect relationships. The behaviourists' example of classical conditioning demonstrates the process whereby a human learns to respond to a neutral stimulus in such a manner that would normally be associated with an unconditioned stimulus. The supporting example often cited with classical conditioning is the case of Pavlov's dog. The focus of Pavlov's experiment was the digestive process in animals. In conducting the experiment, Pavlov noticed that the dog would salivate (response), upon hearing the ringing of a bell because the dog had learned to associate its unconditional stimuli (normally feeding), with the neutral stimuli of the bell ringing simultaneously with the feeding process. Watson, believed that the stimuli that humans receive may be generated internally or externally. To Skinner, voluntary or automatic behaviour is either strengthened or weakened by the immediate presence of a reward or a punishment. The learning principle behind operant conditioning is that new learning occurs as a result of positive reinforcement, and old patterns are abandoned as a result of negative reinforcement. Skinner believed that more complex learning could be achieved by this process of contingencies and reinforcement. "... through successive stages in the shaping process, the contingencies of reinforcement being changed progressively in the direction of the required behaviour"[78].

[76] Ibid, p.135
[77] Santrock, p. 220, 2004
[78] Skinner, p.10, 1968

Applying the theoretical principles of Behaviourism to learning environments, it is easy to recognize that we have many "behaviourist artifacts"[79] in our learning world. A dissection of the traditional teaching approaches used for years would reveal the powerful influence that Behaviourists have had on learning. The concept of directed instruction, whereby a teacher is providing the knowledge to the students either directly or through the setup of contingencies, is an excellent example of the Behaviourist model of learning. The use of exams to measure observable behavior of learning, the use of rewards and punishments in our school systems, and the breaking down of the instruction process into "conditions of learning"[80] are all further examples of the Behaviourist influence. With the advent of the computer in school, computer-assisted instruction (C.A.I) has become a prominent tool for teaching, because from a Behaviourist perspective, it is an effective way of learning. CAI uses the drill and practice approach to learning new concepts or skills. The question acting as the stimulus, elicits a response from the user. Based on the response a reward may be provided. The contingencies of learning are translated into different levels of the program. Rewarding the user to a different level for correct responses follows exactly the approach of operant conditioning. Educators have espoused CAI as an effective teaching approach because it allows for self-paced instruction and it liberates them from the direct instruction of all their students so as to focus on those students with particular needs. Just like social learning theory, behaviourism thus involves interacting with people to learn information. Social learning theory primarily relies on interaction to retain all information, but behaviourism relies on external stimuli.

Going back to our research topic, this theory which is more concerned with behaviour is of great importance to us because it will permits better analysis of behavioural change due to the integration of ICT into the school curriculum. We will through this theory, know how the integration of ICT has affected the teaching-learning activity in government secondary schools in Yaounde V given that learning is a sequence of stimulus and response actions in observable cause and effect relationships.

CONSTRUCTIVIST TEORY (JEROME SEYMOUR BRUNER)

Constructivist theory places emphasis on the development of self-learning (student-centred). Learners are equipped with prior knowledge and understanding to construct meaning of what they learn. Jerome Seymour Bruner is one of the founder of constructivism and the

[79] Ibid
[80] Op.cit

most influential constructivists. He was influenced by Piaget's ideas about cognitive development in children and his ideas have been widely discussed among educators and teachers. Some of Bruner's theoretical principles focus on three main ideas including: The nature of learning and learning process, Instructional scaffolding, and the intellectual development of the learner.

The nature of learning and learning process is a major theme in the theoretical framework of Bruner. Learning to him, is an active process in which learners construct new ideas or concepts based upon their current or past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so. Cognitive structure provides meaning and organization to experiences and allows the individual to go beyond the information given. Concerning instruction, the instructor should try and encourage students to discover principles by themselves. The instructor and student should engage in an active dialog (Socratic learning). The task of the instructor is to translate information to be learned into a format appropriate to the learner's current state of understanding. That is encouraging, aiding and allowing the student to uncover the main principles on their own. Communication between the learner and teacher is the key concept. Socratic learning is suggested as the best method of communication in this theoretical framework, as it allows the teacher to actively note any study skills the learner verbalizes, their progression, their frustrations, and form a rubric of their current learning state based on the dialogue. Seeing as this theory takes known information and expounds upon it, any teacher lesson plans, teacher worksheets, or resources should in fact be constantly building the learner's knowledge in a spiral manner. That is curriculum should be organized in a spiral manner so that the student continually builds upon what they have already learned.

Bruner emphasized four characteristics of effective instruction which emerged from his theoretical constructs including: Instruction should relate to learners' predisposition and facilitate interest toward learning (Personalized), Content should be structured so it can be most easily grasped by the learner (Content Structure), Sequencing is an important aspect for presentation of material (Sequencing), and lastly rewards and punishment should be selected and paced appropriately (Reinforcement)[81]. In his more recent works, Bruner expanded his theoretical framework to encompass the social and cultural aspects of learning as well as the practice of law[82].

[81] Bruner; 1966
[82] Bruner , 1986, 1990, 1996

Bruner's theoretical principles also focus on instructional scaffolding. Based on Vygotsky's ideas about the Zone of Proximal Development, Jerome Bruner and other educational psychologists also developed the important concept of instructional scaffolding. This refers to the process through which able peers or adults offer supports for learning. Bruner's theoretical principles also focus on the intellectual development of the learner. He postulated three stages of intellectual development (stages of representation). These stages are enactive, iconic, and symbolic. Teachers act as facilitators as well as encourager to students in order for them to be actively involved in their learning

In this theory, emphasis is placed on the learner rather than the teacher. It is the learner who interacts with objects and events and thereby gains an understanding of the features of such complex information constructing their own conceptualisations and solutions to problems. This explains the fact that learning is an active, contextualized process of constructing knowledge rather than acquiring it. Knowledge here is constructed based on personal experiences regardless of how one is taught. Thus, even listening to a lecture involves active attempts to construct new knowledge. This takes us to our research topic given that the integration of ICT in government secondary schools in Yaounde Five (V) renders the teaching-learning activity an active and contextualized process of constructing knowledge based on personal experiences which in this case has facilitated the teaching-learning activity.

This theory will thus help us to better analyse the integration of this innovation into Cameroon educational system because the desired objectives of those who share the Constructivist view of learning are coming closer to reality as more people discover the power of computer technology. We are not ignorant of the on-going interactive learning due to the exploitation of the digital media which is taking place in our learning environment today. The implementation of this ICT will enable students as well as teachers to have the ability to construct knowledge in their own minds through a process of discovery and problem-solving as postulated by the Constructivists. Constructivist learning theory sought to improve on what Behaviourist learning theory had already established by focusing on the motivation and ability for humans to construct learning for themselves.

SOCIAL LEARNING THEORY BY ALBERT BANDURA

This theory postulates that people learn from one another, via observation, imitation, and modelling. It has often been called a bridge between behaviourist and cognitive learning theories because it involves attention, memory, and motivation. The theory is related to Vygotsky's Social Development Theory and Lave's Situated Learning, which also emphasize

the importance of social learning. It is one of the most influential learning theories formulated by Albert Bandura a Canadian Psychologist who developed observational learning. It encompasses concepts of traditional learning theory and the operant conditioning of B.F. Skinner. In this theory, Albert Bandura therefore agrees with the behaviourist learning theories of classical conditioning and operant conditioning. However, he adds two important ideas: Mediating processes occur between stimuli & responses and Behaviour is learned from the environment through the process of observational learning[83].

In Observational Learning, the Social Learning Theory says that people can learn by watching other people perform the behaviour. Observational learning explains the nature of children to learn behaviours by watching the behaviour of the people around them, and eventually, imitating them. With the Bobo do experiment Bandura included an adult who is tasked to act aggressively toward a Bobo Doll while the children observe him. Later, Bandura let the children play inside a room with the Bobo Doll. He affirmed that these children imitated the aggressive behaviour toward the doll, which they had observed earlier. Bandura was able to determine three basic models of observational learning, including a Live Model, which is an actual person performing a behaviour, a Verbal Instruction Model, which is telling of details and descriptions of a behaviour and a Symbolic Model, which is either a real or fictional character demonstrating the behaviour via movies, books, television, radio, online media and other media sources.

In social learning theory, the state of mind is crucial to learning. In this concept of mental states, Bandura stated that not only external reinforcement or factors can affect learning and behaviour. There is also what he called intrinsic reinforcement, which is in a form of internal reward or a better feeling after performing the behaviour such as a sense of accomplishment, confidence, satisfaction, and so on. Also, learning does not mean that there will be a change in the behaviour of an individual.

The Modelling Process developed by Bandura helps us understand that not all observed behaviours could be learned effectively, nor learning can necessarily result to behavioural changes. To determine whether social learning is successful or not we have the following modelling process: Attention, Retention, Reproduction and Motivation which are the necessary conditions for effective modelling. One must pay attention to learn, newly learned behaviour should be retain, demonstrate and lastly, one must feel motivated to repeat the behaviour. One can be rewarded by demonstrating the behaviour properly, and punished by displaying it

[83] McLeod, 2016

inappropriately. People learn through observing others' behaviour, attitudes, and outcomes of those behaviours. This is glaring in the theory of vicarious reinforcement of Bandura and Walters which states that a child who sees a hard-working classmate praised by the teacher learns to try that behaviour[84].

According to Bandura, the audio visual aid (internet) has a lot of social influence on human beings as far as teaching/learning in concern. By taking a creative role, learners both construct their own knowledge and raise their level of personal efficiency. The effect of ICT in the teaching/learning processes are immense with regard to Bandura's social learning provided students are introduced into it and the same time motivated through its use. However, the theory strongly implies that there are types of learning wherein direct reinforcement is not the causal mechanism; rather, the so called social element can result to the development of new learning among individuals which is the case of government secondary schools in Yaounde V following the integration of ICT into the school program. This thus explain the necessity of using this theory in our work. Social Learning Theory has been useful in explaining how people can learn new things and develop new behaviours by observing other people. Through this theory, we will be able to deeply examine reasons and outcome of interaction as a result of the implementing ICT in the said institutions.

METHODOLOGY

Here, the procedures applied in carrying out our study includes the research design, geographical location, population, sampling technique, instrumentation and data analysis plan. It is necessary for generating information that will determine the success of this research in reaching its projected conclusion.

Research Design: Research Approach and Research Methods

A research design can be defined as a plan, format or layout which is used to acquire data relating to a given problem. Data is necessary to verify hypotheses or answer research questions in a particular study. This study will involve a mixed methodological approach (qualitative and quantitative). It focuses on collecting, analysing, and mixing of both approaches which some researchers called a "triangulation of method"[85]. Neuman asserts that triangulation is the idea of looking at something from multiple points of view. According to

[84] Bandura and Walters, 1963
[85] Neuman, p. 149, 2006

Amin, "the presentation or use of only qualitative or quantitative approach often presents only a myopic view of things"[86].

We decided to use both approaches so as to provide a better understanding of the research problem because mixed methods offers strengths that offset the weaknesses of separately applied quantitative and qualitative research methods. This helps answers questions that quantitative or qualitative methods alone cannot answer. This mixed methods is a practical and natural approach to research which provide a researcher with a more results. This falls in line with the idea of Neuman who affirms that the idea of looking at something from different viewpoints improves accuracy[87].

A qualitative research can be defined as a research study that explores the quality of relationships, activities, situations or materials. According to Fraenkel and Wallen, it is a research approach that provides a holistic picture of what goes on in a particular situation or setting rather than just comparing the effects of a particular treatment[88]. This approach provide a complete picture of how the integration of ICT in Government Secondary Schools in Yaounde V has brought about behavioural change in the teaching-learning activity.

On the other hand, Amin points out that quantitative research involves the collection of numerical data in order to test hypotheses or answer questions concerning the current status of the subject of study[89]. Quantitative data are obtained when the variable being studied is measured along a scale that indicates how much of the variable is present. They are reported in terms of scores. Neuman assert that "quantitative researchers emphasize precisely measuring variables and testing hypotheses that are linked to general causal explanations"[90]. This approach also supports the construction of qualitative knowledge. The use of this approach in this study is to investigate the extent to which the integration of ICT Government Secondary Schools in Yaounde V has brought about behavioural change in the teaching-learning activity.

This study will employ survey as well as experimental research.The use of survey will permit the collection of quantitative data. According to Fraenkel and Wallen, it is the best way to establish cause-and-effect relationship between variables[91].

Area of the Study (Choice of Study Area)

[86] Amin, p.64, 2005
[87] Neuman, 2006
[88] Fraenkel and Wallen, 2000
[89] Amin, 2005
[90] Neuman, p. 151, 2006
[91] Fraenkel and Wallen, 2000

The area of study refers to the location where this study is carried out. This study was carried out in Mfoundi Division in the Centre region of Cameroon. The country covers a surface area of 475,440 square kilometres and has an ethnically and linguistically diverse population with two official languages, English and French. It is sub divided into ten regions.Our study is precisely carried out in all the Government secondary Schools in Yaounde 5 municipality under Mfoundi Division.

Population of the study

According to Tsafak a population is a finite or infinite set of elements based on which an observation is carried out[92]. Amin also defines a population as "the complete collection (or universe) of all the elements (units) that are of interest in a particular investigation"[93]. The population of the study defines the limits within which the researcher's findings are applicable or are generalized. Thus the population of studies is made up of all the learners and teachers of Government secondary schools in Yaounde 5 municipality.

Target Population

A target population is the population to which the researcher ultimately wants to generalize the results. He further explains that this target population may not be accessible to the researcher. The target population was made up of all the Government secondary schools in Yaounde 5 municipality.

Sampled or Accessible Population

This is the population from which the sample will actually be drawn. The accessible population comprised of students, Computer Science teachers, some non-Computer teachers, Multimedia staffs and Monitors from Government secondary schools in Yaounde 5 municipality, Mfoundi Division. This therefore is a fraction of the population on which the research is based, where we administered questionnaires.

Sample and Sampling Technique

To obtain a representative sample for this study, a number of sampling techniques were employed. Firstly, purposive sampling was used to select the target population. The researcher sought the opinion of his colleagues and focused more on those classes that have got high experiences and knowledge in ICTs. The researcher being a teacher in one of the target institution (Government Bilingual High school Yaounde), conducted a direct observation on

[92] Tsafak, 2004
[93] Amin, p.6, 2005

students and teachers' use of ICT in the said institution. The researcher finally employed a simple random sampling and systematic random sampling in classes visited to obtain the desired sample size of 300 respondents initially desired for this study.

Data Source and Collection

The research methodology employed in this study comprises of two major information sources. These include the secondary sources and the primary sources.

Concerning the secondary sources, several documents were consulted so as to gather information related to our study. Libraries and internet sources were consulted.

Moreover, Primary Sources were visited as well. Several visits were made to the field, structured questionnaires and an interview guide were used where necessary. Field trips and Structure Questionnaires made up our primary sources. Questionnaires were administered and this helped in semi-structured interview. A detail questionnaire was elaborated covering major elements necessary for a broad base data collection. Our questionnaire embodied characteristics of a participative diagnostics approach. The questionnaire constitutes both closed and opened questions to enable the easy flow of information. The collected data was sorted and classified. Direct Observation involving just the researcher and the target population was done. A participatory observation was employed. And lastly, interview Guide was used. The guided discussion method involved the active participation of the school multimedia centre or computer halls and Resource persons. This helped direct discussion in a particular direction to prevent going out of topic or waste a lot of time. This interview guide thus provided substantial information that is not included in questionnaire and thus helped in the analysis of this work.

Instruments for Data Collection

The main research instrument for this study was a Questionnaire and an Interview guide carefully designed with respect to the dependent and independent variables under study.
The questionnaires were administered to students in the said schools. The instrument consisted of two sections (A and B) designed to assess the integration of ICT in Cameroon government secondary schools in Yaounde 5 and behavioural change in teaching-learning activity.

In section A, biographical and demographic information was requested from the respondents. This section consisted of the general identification of the respondents. Section B of the instrument sought to measure the respondent's access to ICT tools, its importance to them and the outcome faced by respondents with integrating this innovation into their curriculum. This section help the researcher to verify all the research hypothesis.

The questionnaire had an introductory phase in which the researcher gave her identification to the respondents and appeal for honest responses and an assurance of confidentiality. It finally ends with a statement of appreciation to the respondent for participation.

Validity of the Questionnaire

The researcher collected content-related evidence to check the validity of this instrument. The first draft of questionnaire was prepared by the researcher and gave to the supervisor who critically went through, correct and made suggestions before the research administered to the given population. In order to check whether the questions and items were to be understood by the participants, a pilot study was conducted. This was done by administering the questionnaires to 10 students who were not part of the sample but constituted part of the population. After analysing the responses for the pilot study, the researcher identified no difficulties with the participants in understanding the questions and items. This gave confidence and courage to administer the instrument to the actual sample of the study. This also ensure that the content of the questionnaire was appropriate, comprehensive and capable of measuring the variables.

Administration of the Questionnaire

The researcher began the exercise by paying a visit to all the schools selected for the study. At each school, the researcher presented herself using the research attestation and her professional card which facilitated access to the various schools. Also, given the importance attached to the study, some of the teachers made the administration of the questionnaires easier by offering part of their teaching time for the exercise.

The Variables of Study

This research work constitutes two main variables which include the independent and dependent variables. Independent variable here is behavioural change whereas the dependent variable is the integration of ICT. This is because behavioural change in the teaching-learning activity is depended on the integration of ICT in the school in question.

METHOD OF DATA ANALYSIS

The data was analysed with the use of descriptive statistics. Inferential statistics were used to test the research hypotheses. This Inferential statistics encompasses chi-square test

which was used to compare distributions. This test was considered appropriate for this study because the study is a rational one. The chi-square is used to find the relations as well as verifying any significant differences between the dependent and independent variables.

The chi-square (x^2) value was computed using the formula;

$$X^2 = \Sigma \frac{(O-E)^2}{E}$$

Where O = Observed frequency, E = Expected frequency, and Σ = Sum of.

The formula for computing the expected frequency (E) is as follows: $E = \frac{tr \times tc}{N}$

Where tr = Total frequency of rows.

tc = Total frequency of columns

N = Total number of observations (number of respondents).

Having computed the chi-square value, the chi-square critical value is determined with the help of the degree of freedom (df) which is found using the formula Df = (r-1) (c-1).

Where (r) = Number of rows and (c) = Number of columns. Given the degree of freedom and alpha level of significance which was chosen at 0.05, the critical value was determined. The chi-square (X^2) calculated value was compared to the chi-square critical and inferences were made following the decision rule which states that:

i) THE NULL HYPOTHESIS (Ho) is rejected if the obtained or calculated X^2 is greater than X^2 critical value (X^2 calculated > X^2 critical).

ii) THE NULL HYPOTHESIS (Ho) is retained if the obtained or calculated X^2 is less than the X^2 critical value. (X^2 calculated < X^2 critical).

From inferences made, a conclusion was drawn indicating the existence of a relationship or no relationship between the variables. In case there is a relationship, the degree of relationship was calculated using the contingency coefficient © formula thus:

$$C = \sqrt{\frac{X^2}{N + X^2}}$$

Where X^2 = chi-square calculated and N = Number of respondents (Sample size).

The value obtained was then compared to the contingency maximum (Cmax) using the following formula:

$$Cmax = \sqrt{\frac{K-1}{K}}$$

Where K = Small number of rows or columns. The degree is expected to be low, moderate or high depending on the magnitude.

PART ONE

IMPLAMENTATION OF ICT AND PEDAGOGIC CHANGE IN CAMEROON SECONDARY SCHOOLS

CHAPTER ONE
INTEGRATION OF ICT INTO THE SCHOOL PROGRAM AND ITS PEDAGOGIC UTILISATION IN CAMEROON SECONDARY SCHOOLS

ICTs are hardware, software, networks and media for the collection, storage, processing, transmission and presentation of information as well as related services. Their integration into a school curriculum is aimed at promoting learner-centred approach in education since it integration is the use of ICT to introduce, reinforce, supplement and extend skills[94]. This integration leads to a shift from the traditional instruction model of knowledge transmitting towards autonomous, active, and collaborative learning. This chapter therefore examines a general view of the implementation of ICT in Secondary Schools especially in Cameroon and the Pedagogic implications of this implementation. Given the importance of ICT to an educational system and society at large, an overview of initiatives undertaken for its integration in Cameroon educational system is examined. Also it Legal and Policy development are presented not leaving out the short-comings of this innovation. More to that, the implications or effects of pedagogical use of ICT in secondary schools is equally examined in this chapter.

1.1 THE INTEGRATION OF ICT INTO THE SCHOOL CURRICULUM

ICT changes teaching and learning through its potential as a source of knowledge, a medium to transmit content, a means of interaction and dialogue[8495]. In this age of information and technology, the educational institutions need not just impart knowledge to individuals, but enable them to change into lifelong learners as seen in Cameroon educational system. Keeping in view its importance in education, initiatives taken, Legal and Policy development, and difficulties in implementing ICT in the Cameroon Education system is thus examined.

1.1.1 Initiatives taken to Integrate ICTs in Schools

Cameroon is among the sub-Saharan African countries that are making enormous progress in the use of the Information and Communications Technologies (ICTs) in the various development sectors, including education. This innovation play a vital role in ameliorating the Cameroon educational system since ICTs deals with hardware, software, networks and media

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94 Pisapia, J., Teaching with technology: Exexmplary teachers, Research Brief No. 6, Richmond, VA: Metropolitan Educational Research Consortium (ERIC Document Reproduction Service No. ED 411 359), 1994.

95 Jenkins, J., Teaching for Tomorrow, the Changing Role of Teachers in the Connected Classroom, 1999. Retrieved November 13, 2008, http://www.eden-online.org/papers/jenkins.pdf

for the collection, storage, processing, transmission and presentation of information and other related services. Between 1998 and 1999 private efforts were made in private and mission schools like College François Xavier Vogt to use ICTs in -education whereas it was in 2001 that they were introduced in public schools in Cameroon. In secondary schools, they were actually introduced in 1998 but only became operational four years later with the setting up of the general inspectorate in charge of Computer Science[96]. Given no specific policy to guide the teaching or use of ICT in education, private schools applied their own teaching method or programme. It is important to note that before the ministries of education could provide the ICT curricula, several private primary and general secondary and technical schools in major cities had acquired computers and begun to provide courses on ICTs and with ICTs[97]. It was later in February 2001 that the President of the Republic called for the orientation of education toward the knowledge economy in his address to the Cameroon youths. This led to the official introduction of ICTs in general and technical secondary schools and since then many schools have been receiving presidential grants in the form of Multimedia Resource Centres with Internet connection.[98]

Government involvement in the area of ICTs seriously began with the development of the policy document and the general strategy for the integration of ICTs in all sectors by the National Agency of ICTs (ANTIC) and the setting up of Multimedia Resource Centres in some primary and secondary schools (Government Bilingual High school Yaounde, Lycée General Leclerc, Yaounde and Government Bilingual High School, Joss, Douala), and some primary schools like École des "Champions" of the Chantal Biya Foundation.

By 2003, official ICT programmes for secondary schools were conceived and ICT syllabuses and National Sequential Schemes of work published in 2008 were made available to Nursery, Primary and Teacher Training Education.**[99]** Textbooks have also been written and validated by the National Book Commission to facilitate the teaching of ICTs**[100]**. République also made mention of the draft strategy to implement the national ICT policy in basic education

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[96] Fouda N. et al. , *Un Profil de Compétences pour les Professeurs d'informatique de l'Enseignement Secondaire Camerounais,* Int Rev Educ DOI 10.1007/sl 1159-013-9344-6, 2013.

[97] Karsenti, T. et al., Pedagogical Integration of ICT, Successes and Challenges from 100+ African Schools, Ottawa, ON, IDRC, 2012.

[98] Mbangwana, M.A., Introduction of ICT in Schools and Classrooms in Cameroon**,** In K. Toure, T.M.S. Tchombe, & T. Karsenti (Eds.), *"ICT and Changing Mindsets in Education"*, Bamenda, Cameroon, Langaa; Bamako, Mali: ERNWACA / ROCARE, 2008.

[99] ERNWACA-Cameroon, Integration of Information Communication Technology in Education in Central and West Africa, A Case study of Pioneer Schools in Cameroon, Yaoundé, 2005.

[100] Ibid., 2008.

which was applicable from 2007- 2015 and developed in 2007.[101] This strategy was targeted at training teachers and head teachers in the importance and how to use ICTs in teaching and learning as well as in school administration. Based on training objectives, national guidelines were also included in the teaching of ICTs in preschool and primary schools. The guidelines were based on six modules for each level including the skills to develop which were: the discovery and presentation skills, application skills, "knowledge construction skills, health and safety issues related to ethics and equity.[102]

Due to the lack of teaching staff, infrastructure and finance, the State went into a partnership with private contractors and Parent/Teacher Associations (PTA) in 2005 to supply computer equipment and the provision of finance respectively.[103] In 2007, the field of Computer Science and Educational Technologies was established at the Higher Teacher Training College (HTTC) Yaounde to train general secondary school ICT and Computer Science teachers. The following year, a similar field was established at the Higher Teacher Training College, Maroua in the Far North Region of Cameroon. In 2009, an information management system was set up at the Higher Teacher Training College, Bamenda so as to train technical secondary school teachers. This led to the institution of Information Technology as a school subject in January 2011, which became effective in February of the same year. Information Technology was therefore introduced as a compulsory subject in all MINESEC official examinations.

Apart from government initiatives, non-governmental organizations like ADCOME have also contributed at regional levels to bridge the digital divide in secondary schools in the southwest region of the Cameroon through their Computer and Internet Access Centres (CIAC) project. According to Nganji, J. et al., ADCOME's initial objective was to bring internet closer to the people at low cost in 20 00.[104] In 2001, motivated by the achievement of this objective, it further launched the CLAC project to install computers and internet as well as providing training for teachers in secondary schools with the first pilot school being the Baptist High School Buea.

However, even though 96.23 per cent of public primary schools pupils and secondary school students are taught ICT lessons and 100 per cent[105] of Teacher Training Colleges

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101 République du Cameroun, Stratégie nationale de développement des technologies de l'information et de la communication, Yaoundé, Cameroun, *Agence nationale des technologies de l'information et de la communication* (ANTIC), 2007c. www.observatoiretic.org/documents/show/87

102 Ibid., 2007.

103 Op.cit., 2013.

104 Nganji, J. et al., ***Closing the digital gap in Cameroonian secondary schools through the CIAC project***, International Journal of Education and Development using Information and Communication Technology (IJEDICT), Vol. 6, Issue 2, 2010, pp. 106-114.

105 ERNWACA-Cameroon, Integration of Information Communication Technology in Education in Central and West Africa, A Case study of Pioneer Schools in Cameroon, Yaoundé, 2005.

teaching ICTs to student teachers, a greater part of the training is still theoretical due to the chronic lack of resources and infrastructure. Educational Research Network for West and Central Africa (ERNWACA) carried out a joint research with PAQUEB in 2009" and in 2010 and found that 87 per cent of all teaching, is only theory since only 3 per cent of all public primary schools have computers.

Also, MINESEC in partnering with MTN foundation based on the 2013 partnership agreemen[106], launched the first competition in 2014 to reward teachers who integrate ICTs in teaching techniques and methods to improve learning. The competition was aimed at motivating both public and private secondary school teachers nationwide in the use of technologies without discrimination, to stimulate the quest for research in innovative teaching methods and contribute toward achieving quality education[107]. Despite apparent challenges such as connecting more Cameroon schools to a nationwide network and the Internet, providing schools with technological resources, training more teachers and financing ICT integration projects, there exist success stories like that of schools such as *"Les Champions"* of the Chantal Biya Foundation, situated in the Centre Region. This school can boast that all students are provided with computers.[108] The setting up of SIGIPES (Système Intégré de Gestion Informatisée du Personnel de L'État et de La Solde) which means an Integrated Computerized State Personnel and Payroll Management System handles personnel and payroll data, an online registration system for the competitive entrance examination into the Higher Teacher Training College and the online registration of both old and new students at in the university of Yaounde I has been operational since 2011 and 2012 respectively. Multimedia

Resource Centres have been setup in universities and professional schools and in some public secondary schools; the training of monitors who manage the MRCs, the creation of platforms' for learning; the interconnection of the eight state universities and the establishment of training departments in professional schools and universities and most are now operational. What is most promising is the continuous training of teachers both in the use of ICTs in teaching as a tool and as a discipline in the various Teacher Training Colleges.

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[106] Camerpost 2013, MTN Foundation launches "Digital Schools", 2015.
http://www. cameroonweb. com/CameroonHomePage/economy/MTN-Foundationlaunches-Digital-Schools 2015-323727?lang=

[107] *Wong, C., "Competition to choose the best teacher User and integrator of ICTs by MINESEC-MTN foundation partnership", 2015.* **http://tobbyvision***. blogspot. com/2015/05/competition-to-choose-best-teacher- user. html*

[108] *Karsenti, T., Collin, S. & Harper-Merrett, T., "Pedagogical Integration of ICT: Successes and Challenges from 100+ African Schools ", Ottawa, ON, IDRC, 2012.*

Furthermore, there are main bodies in charge of ICT Education in Cameroon. They includes M1NEDUB, M1NESEC, the National ICT Agency (ANTIC) and NEPAD which is a non-Cameroon government organization. MINEDUB and MINESEC have been carrying out remarkable projects since the introduction of ICTS in schools under their ministries. MINEDUB has been working through PAQUEB (Projet Pilote pour L'Amélioration de la Qualité de L'Education de Base) meaning Pilot Project to improve the quality of Basic Education concerning the implementation of the one laptop per child project in Cameroon. MINESEC for its part has been opening multi media centres and it can now boast that, 80 per cent of secondary schools have computer rooms and 60 per cent have computers[109]. ANTIC (Agence Nationale des Technologies de l'Information et de la Communication) known in English as National ICT Agency, drafted the first national policy for the development of ICTs in 2007. ANTIC is in charge of cyber security, cyber-crime and fraud related issues. It also lays down rules and recommendations for schools and parents to use in preventing children from accessing illegal and immoral contents by setting and blocking undesired websites. The New Partnership for Africa Development (NEPAD), a non-Cameroon government organisation is in charge of the e- Schools project in Cameroon. The e-schools initiatives operate in many African countries with the aim of providing primary and secondary school pupils and students with ICT skills and Knowledge in order to enable them to be competent in the emerging information society[110]. Given that we are operating in the 21st century or computer age whereby students are supposed to meet up with the technological demands.

1.1.2 Legal and regulatory framework

The project for introducing ICTs in schools was given an impetus by two presidential statements in 2001[111], which brought -JCTs into the realm of education at all levels of schooling. These statements made it clear that imported computers and their accessories were to be duty free for schools. Moreover, the World Bank in its ICT task force policy has raised the concept of cyber education in the global school system[112] to promote the development of computer technology, improve the accessibility of learners to IT, and to encourage digital inclusion in developing countries. Consolidating the presidential statement and the World Bank

[109] GRID, Country Profile-Cameroon, 2014. http://www.fosigrid.org/africa/cameroon "

[110] Ibid, 2024

[111] www.cam-educ.com/actu/discours.htm

[112] World Bank Education, http://www.worldbank.org/education

initiative, MINEDUC authorised the Inspectorate General of Pedagogy in charge of teaching computer sciences at all levels to design and develop a project on cyber education in Cameroon which was implemented in April 2001.[113]

In 2004, key strategies on using ICTs in education were highlighted in the first official draft of the Cameroon National Information and Communication Infrastructure (NICI) policy and plan prepared by the government with support from the United Nations Development Program (UNDP) and the United Nations Economic Commission for Africa (UNECA)[114]. In this document, the Cameroonian government recognises ICTs as a national priority along with education, health, forestry, and governance. As indicated in the NICI plan document, the government has resolved to achieve the following:

- Modernising the educational system through the introduction of ICTs in schools
- Introducing ICT application training modules into national universities
- Preparing a sectoral ICT policy for the educational sector
- Training teachers in the use of ICTs
- Equipping all schools with ICT facilities
- Multiplying pedagogic resource centres for teachers and students
- Establishing distance training facilities
- Providing support for the production of ICT teaching materials

The plans are implemented in the framework of two projects: one on cyber education, and another that concerns higher education (universities and professional training schools).[115]
Also, in June 2005 the Prime Minister of Cameroon signed a decree8 creating and organising the national sub-committee for the integration of ICTs in education[116].

1.1.3 Policy implementation and development

The implementation phase started in 2001 and, since then, the government has signed a number of decrees to pave the way for the introduction of ICTs in education. In 2002 a ministerial decision defining the condition for the creation of MRCs in government secondary schools was published. Then in 2003 a decree introducing ICTs in education was published by the Ministry of National Education (presently, the Ministry of Secondary Education). The

[113] Ibid

[114] Plan national des infrastructures de la communication et de l'informatiop du Cameroun (NICI) 2004-2015, République.

[115] Technical Document on the Cyber Education Project in Cameroon, n.d, The Ministry of Secondary Education.

[116] Prime Minister's Decree n°087/CAB/PM of 27 June 2005 creating a Committee for the integration of ICTs in education in Cameroon, 2005.

decree made it clear that ICTs would become an obligatory discipline beginning in September 2003. The Ministry of Secondary Education was reorganised to include a new unit called CAAP, the National Pedagogy Support Unit (Cellule d'Appui à l'Action Pédagogique). CAAP is equipped with a distance training unit called Unité de Formation à Distance (UFAD) and is expected to ensure the training and capacity-building for teachers, which includes distance learning.

Several factors influenced the implementation process. Some of them includes budget availability, weak linkages between stakeholders and project management, and co-ordination. There is no specific board or organ in charge of the co-ordination of the global cyber education project in Cameroon. Stakeholders seem to be evolving independently, thus resulting in some ignoring what others are doing.

Regarding the development of ICT policy in Cameroon, it was decided that an all ICT policy would be prepared for the educational sector. Stakeholders are therefore in need of adequate co-ordination and technical support to design and adopt a specific policy.

1.1.4 Difficulties in Implementing ICT in the Cameroon Education system

There are so many constraints still facing the integration of ICTs in education in Cameroon. These includes Institutional challenges, Training and capacity-building, Sustainability, and Infrastructure.

Despite the legislation establishing ANTIC, the ICT sector in Cameroon still seems chaotic. Regarding institutional challenges of ICT integration in education, it was observed that there are no fewer than eight governmental players claiming authorship or supervision of the national ICT policy. The results are power struggles and subsequent appeasements which has a negative impact on ICT-related educational projects and programmes. This also explains why stakeholders have not been able to reach a consensus on the preparation of a sectoral policy on ICTs in education and on distance learning.

Training and capacity-building of teachers constitutes another constraint in implementing ICTs in Cameroon education. In secondary schools, between 2003 and 2010, there were no qualified teachers except part-timers who were either graduate students in Computer Sciences or teachers of other disciplines like Mathematics, Physics, who had little or no knowledge in Computer Science pedagogy. Fouda et al. reveal that since the 2010- 201'lacademic year, Higher Teacher Training colleges train 300 Computer Science and ICT teachers to cater for a student population

of more than 1,200,000; a ratio of 1 teacher for 400 students[117]. Presently, more and more teachers are trained in Computer Science and ICT pedagogy. This will obviously increase the number of Computer Science and ICT secondary school teachers in Cameroon. In addition, principals, in-service teachers of other disciplines and all other staff in the management of education that could constitute relays to disseminate ICTs in the educational system, have no access to professional training. Heads of institution and Computer Science, pedagogic Inspectors of other disciplines such as Mathematics, Physics, do not undergo any form of professional training in the use of ICTs that would enable them to take up their new responsibilities.[118]

The situation in primary schools is not so different from that of secondary schools. Available research reveals that very little or no training has been carried out for in-service teachers to initiate them in the use of ICTs or to improve their skills and knowledge since its introduction in schools in 2001.[119] In the little cases where it is conducted, it is done in the form of a pedagogy seminar. The one day seminars are held once in a term giving a total of 3 days per academic year, say 18 hours of effective instruction.[120] This is absolutely insignificant given that technologies evolve rapidly. The lack of qualified teaching staff is closely linked to the lack of permanent technical assistance in Schools with ICT laboratories. As a result, when systems break down, it takes a longer period to repair them and since many classroom teachers do not have the opportunity to undertake professional development, they usually feel frustrated and discouraged when they meet the least challenges.

Sustainability constitutes another constraint facing the integration of ICT into Cameroon educational system. Most ICT integration projects suffer sustainability in Cameroon today because little or no budget is allocated for the purchase of technological equipment. For instance in his country profile report, Tetang notes that:

> *Projects rely on external funding which puts their sustainability into question. Moreover, government secondary and primary schools have a low purchasing power, and no budget has been allotted to them to support ICT- related activities in schools. Most computers used in schools are donations.*

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[117] **Fouda N. et al. ,** *Un Profil de Compétences pour les Professeurs d'informatique de l'Enseignement Secondaire Camerounais,* **Int Rev Educ DOl 10.1007/sl 1159-013-9344-6, 2013.**

[118] Ibid., 2013

[119] Inspectorate of Pedagogy in charge of ICTs, annual reports, 2009, 2010, 2011

[120] Nkwenti N. M., "Mastery of Active and Shared Learning Processes for Techno-Pedagogy (MASLEPT), A Model for Teacher Professional Development on Technology Integration", ***Creative Education,*** 6, 32-45, 2015. http://dx.doi.org/! 0.4236/ce.2015.61003

Since most of the online learning resources accessible through the government secondary school learning.platform CAM-EDUC are in French, it acts as a hindrance for the English speaking-community. Worse still, all those online resources are not based in Cameroon but located in Europe'[121].

Moreover, government secondary and primary schools have a low purchasing power, and no budget has been allotted to them to support ICT-related activities in schools. Most computers used in schools are donations. Since most of the online learning resources accessible through the government secondary school learning platform CAM-EDUC are in French, it acts as a hindrance for the English speaking-community. Worse still, all those online resources are not based in Cameroon but located in Europe.

Furthermore, infrastructural insufficiency equally constitute another constraints facing the integration of ICTs in education in Cameroon. Fouda et al. noted in their research that the 2009/2010 school year statistics reveal that out of over 1,000 secondary schools in Cameroon, only 100 have the necessary equipment to teach Computer Science.[122] [123] [124] They further exemplify that Yaounde, the political capital of Cameroon with a student population of 94,267, has only 1,159 computers giving a percentage of 81 students for 1 desktop. On the basis of a 2009/2010 study, only 3 % of all public primary schools have computers and 87 % of all ICT teaching is theoretical[112]. In some schools, MRCs are installed in inappropriate buildings, some of which have poor roofing systems. There is also a gap between rural and urban areas. Nearly all service providers are concentrated in urban areas. Due to that fact that

many secondary schools are established in zones not yet reached by the electric power, some have started teaching ICTs theoretically. Building educational or learning platforms requires establishing adequate equipment to host and maintain educational Web sites and training staff to manage electronic data. This is a serious bottleneck for the various educational initiatives, since the educational institutions in general have weak ICT infrastructure. Some do not have Web sites, and the existing ones need to be well maintained to ensure that they are permanently

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121 Tetang, T. J., "Survey of ICT and education in Africa, Cameroon Country Report ", Survey of ICT in Education in Cameroon, In, ***Survey of ICT and Education in Africa, Country Reports,*** vol. 2, no. 53, Washington DC, infoDev/World Bank, 2007, p.2.

[1,0] Tetang, T. J., "Survey of ICT and education in Africa, Cameroon Country Report ", Survey of ICT in Education in Cameroon, In, ***Survey of ICT and Education in Africa, Country Reports,*** vol. 2, no. 53, Washington DC, infoDev/World Bank, 2007, p.2.

124 Fouda N. et al. , *Un Profil de Compétences pour les Professeurs d'informatique de l'Enseignement Secondaire Camerounais,* **Int Rev Educ DOI 10.1007/sl 1159-013-9344-6, 2013.**

[1,2] ERNWACA-Cameroon, "Integration of Information Communication Technology in Education in Central and West Africa: A Case study of Pioneer Schools in Cameroon. Yaounde", ERNWACA-Cameroon, 2010. http://www.ernwaca.org/panaf/IMG/pdf/Nkwenti-PanAf-policy-dialogue-workshop.pdf

functional.

1.2 THE PEDAGOGICAL USE OF ICT IN SECONDARY SCHOOLS

The use of ICT in education is widely regarded as a good thing because it improve the teaching and the learning process. It has a pervasive presence in society for which all participating citizens need appropriate skills. Some resultant effects from the integration of ICT in education includes; Enhancing the teaching and learning activity, and Psycho- Pedagogical effects. On the other hand, ICT in education has equally deviated learners from educational purpose.

1.2.1 Enhancing the teaching and learning activity

ICT has the added potential to significantly enhance educational reform by enabling teachers and learners to move away from traditional to more innovative and effective approaches to teaching and learning.[125] Outside the education profession, advocates of ICT argue its importance as a tool for future life, an investment in careers for individuals and contributing to the future prosperity for the country. Within education, ICT is seen as a tool for assisting and enhancing learning throughout the curriculum. Less widely appreciated is a view of ICT's potential to change ways of learning. Access and use of ICT made both teachers and students potential participants in the great enterprise of knowledge construction because of the availability of information.

According to research carried out by Moses Atezah Mbangwana, teachers in some eight Secondary schools in Cameroon (Lycée Bilingue Yaoundé, Lycée Général LeClerc Yaoundé, Collège des Lauréats Douala, Lycée Joss Douala, Lycée Technique Garoua, Lycée Technique Bafousam, Longla Comprehensive College Bamenda, Ecole Oiselets Bafoussam) indicated that ICT is useful to students because it enables them to obtain information, do research, learn and understand better, and also to communicate.[126] The teachers use 1CT for documentation, to access teaching and learning material for their classroom use. In most cases, computer lab monitors download information for teachers who make such requests.

In addition to using ICT to prepare lessons,' many teachers also use it to calculate and filled in Students' marks. At government Bilingual High School Yaounde, the Head of the Computer

[125] DoE, 2003. Draft White Paper on e-Education ***Transforming Learning and Teaching through ICT,*** 2003. http://www.gov.za/documents/download.php?f=68777

[126] Mbangwana, M. A., Introduction of ICT in Schools and Classrooms in Cameroon. Dans K. Toure, T.M.S, Tchombe et T. Karsenti (dir.), ***ICT and Changing Mindsets in Education,*** Bamenda, Cameroun: Langaa et Bamako, Mali, ERNWACA/ROCARE, 2008.

Unit said, "science and math teachers particularly those teaching geometry make profuse use of the multimedia centre to search for information."[127] In the case of government Technical Garoua, the internet is exploited in teaching such subjects as accounting and management. There is'a shift from textbook-based schooling to web-supported community of inquiry though a culture of inquiry in schools has been a pedagogical ideal as evident in the writings of Dewey and Bruner[128], it has not been an enduring reality.

The pedagogic use of ICT in Cameroon educational system has made learning more Active, Collaborative, Integrative, and Evaluative as well.

Learning has become more active given that ICT-enhanced learning mobilizes tools for examination, calculation and analysis of information in order to provide a platform for student inquiry, analysis and construction of new information. The learners therefore, learn as they do and, whenever appropriate work on real-life problems in-depth. Moreover, thanks to ICT learning becomes less abstract and more relevant to life situations. In contrast to memorization-based or rote learning, that is the feature of traditional pedagogy, ICT- enhanced learning promotes increased learner engagement and open learners to more learning materials and several documents as is the case now with Cameroon Students.

Collaborative learning is equally observed with ICT-supported learning. This is due to the fact that it encourages interaction and cooperation among students and teachers. Apart from modelling real world interactions, ICT-supported learning provides opportunity to work with students from different cultural backgrounds. This therefore helps to enhance learners teaming and communication skills as well as their global awareness. It models learning done throughout the learner's lifetime by expanding the learning pace to include not just peers but also mentors and experts from different fields.

Learning has also become more integrative with information and communication technology given that ICT-enhanced learning promotes a thematic integrative approach to teaching and learning. This approach eliminates the artificial separation between the different disciplines and between theory and practice, which characterizes the traditional approach. Moreover, pedagogic use of 1CT has makes learning evaluative given that ICT-enhanced learning is student-directed and diagnostic. Unlike static, text or print-based education, ICT- enhanced

127 Ibid., 2008.

128 Bruner, J.S., Toward a Theory of Instruction, New York, NY, USA, W.W. Norton, 1966. Dewey, J., Experience and Education, New York, NY, USA, Macmillan, 1938.

learning recognizes the presence of different learning pathways to explore and discover rather than merely listen and remember. However, in order to improve, and make optimal use of ICTs, changes in the pedagogic approaches and classroom strategies as well as integrating ICT in teacher training and staff development practices accompanied by teacher motivation schemes are imperative.

1.2.2 Psycho-Pedagogical Implications

Computer sciences applied to education have been causing a real revolution in the teaching and learning process. One modality is to computerize traditional teaching methods. Another is to apprehend the computer as an educational tool with which the learner solves problems related to several areas of knowledge. Considering this constructivist approach, no distinction exists between subject matter knowledge and pedagogical knowledge because all knowledge is pedagogical in varying ways. Constructivism implies that "knowing" is created rather than transferred. Two ideas emerge from this conception of learning. Learners are active in constructing their own knowledge and social interactions are important to knowledge construction.

In dialectical constructivism, in reflective classroom situations, students interact with other students and with teachers in ways that stimulate both knowledge construction and cognitive growth. The main aim of teaching, from a constructivist perspective, is not so much to transmit information but to encourage knowledge formation and metacognitive processes for judging, organizing, and acquiring new information.[129] What becomes important for teachers is to understand how students construct and use their understandings. These constructive processes of knowledge growth occur in a social context as a result of interpersonal interactions. Based on these views ICT can provide learning opportunities. But there is the need to understand ICT and the way it can pedagogically constrain or enable particular activities. For teachers, reflection and action is required on the ways they incorporate technology, with gender alertness, into their pedagogy.

1.2.3 Deviate from educational purpose

Although the integration of ICT has brought a lot of merits in education, there is still some uncertainty over the merits of educational use. Firstly, there is a danger that students may

[129] Brüning R.H., Schraw, G.J., Norby, M.M., & Ronning, R.R., Cognitive Psychology and Instruction (4th ed.), Upper Saddle River, New Jersey and Columbus, Ohio, USA, Pearson Merrill Prentice Hall, 2004.

be confused by the multiplicity of available information from which to choose[130]. Secondly, the prevalence of undesirable websites poses a real threat.[131] The prevalence of undesirable websites is a critical concern that could affect learning and teaching because the teacher has to spend, much time trying to control students from using websites unrelated to the learning content, instead of teaching[132].Furthermore, learners may spend time surfing websites that show pornographic material as they seek to explore the Internet. These challenges bring into question the issue of security, not in terms of physical security but in terms of access to information security. Thirdly, the openness of the web puts students into an exploratory mode which often challenges effective learning in time-constrained formal school systems[133]. As a result students tend to misuse the technology for leisure time activities and have less time to learn and study as observed in Government Bilingual High School Yaounde. According to Yousef and Dahmani online gaming, use of Facebook, chat rooms and other communication channels as perceived drawbacks of ICT use in education, because students easily switch to these sites at the expense of their study[134]. It is also possible that the use of ICT may affect students' behaviour. Mikre also identifies the following major limitations of ICT use in education as related to student behaviour. These includes:

- "Computers limit students,
- Over-reliance on ICT limits students' critical thinking and analytical skills,
- Students often have only a superficial understanding of the information they download,
- Computer-based learning has negative physical side-effects such as vision problems,
- Students may be easily distracted from their learning and may visit unwanted sites,
- Students tend to neglect learning resources other than the computer and the Internet,
- Students tend to focus on superficial presentations and copy from the Internet,
- Students may have less opportunity to use oral skills and hand writing,
- Use of ICT may be difficult for weaker students, because they may have problems with working independently and may need more support from the teacher''[135].

However, in as much as ICTs have innumerableO>enefits, there are disadvantages or threats

[130] Mikre, The Roles of ICT in Education, Review Article with Emphasis to the computer and Internet, ***Ethiopian Journal of Education and Science,*** vol. 6, No. 2, 2011, p. 13.
[131] Devadason, R . P., The State of use of ICT in the Teaching and Learning of Science and Mathematics among schools in SEAMEO Member Countries, SEAMEO RECSAM, 2010a, p. 14.
[132] Ibid., 2011, p. 13
[133] Ibid., 2010a, p.14
[134] Mikre, The Roles of ICT in Education, Review Article with Emphasis to the computer and Internet, ***Ethiopian Journal of Education and Science,*** vol. 6, No. 2, 2011, p.12
[135] Op.cit., 2011, p.13

that must be equally checked and properly managed in order to ensure its maximum uptake, utilisation and benefits, for both teachers and learners. And if the disadvantages are left unchecked, they may outweigh the advantages.

From the subsequent chapter, there is no doubt that the integration of ICT in education has leads to educational reforms given a shift from the traditional instruction model of knowledge transmitting towards autonomous, active, and collaborative learning. Cameroon just like any other African country, has fully embraced this innovation so as to better her educational system. This is seen in the initiatives undertaken, their policy and regulatory framework, and the how this policy has been implemented. Despite the fact that ICT in education ameliorate the teaching and learning process there are some threats that must be properly checked and managed in order to ensure its maximum use and benefits in education.

CHAPTER TWO
GOVERNMENT SECONDARY SCHOOLS OF YAOUNDE FIVE MUNICIPALITY AND THEIR HISTORICAL DEVELOPMENT

The Yaounde 5 Municipality was created by Presidential Decree No. 93/321 of 25 November 1993 which split from Yaounde I council. It is managed by a municipal council of 41 members, and a municipal executive composed of a Mayor and four deputies. There exist just three Government Secondary Schools in this Municipality which constitutes our target population. Examined therefore in this chapter, is the physical aspects of these Schools and the historical growth or evolution of the schools. An overview of this area is thus important because it gives a better insight of our studied area.

2.1 Physical Aspects

The Yaounde V municipality is located in the Centre region of Cameroon, at Mfoundi division. The government schools found in this municipality includes; Government Bilingual High school Yaounde, Government High School Nkolmesseng, and Government High School Ngousso-Ngoulmekong. An understanding of their geographical location as well as their growth and evolution will give us an insight of our studied area.

2.1.1 Geographical Situation

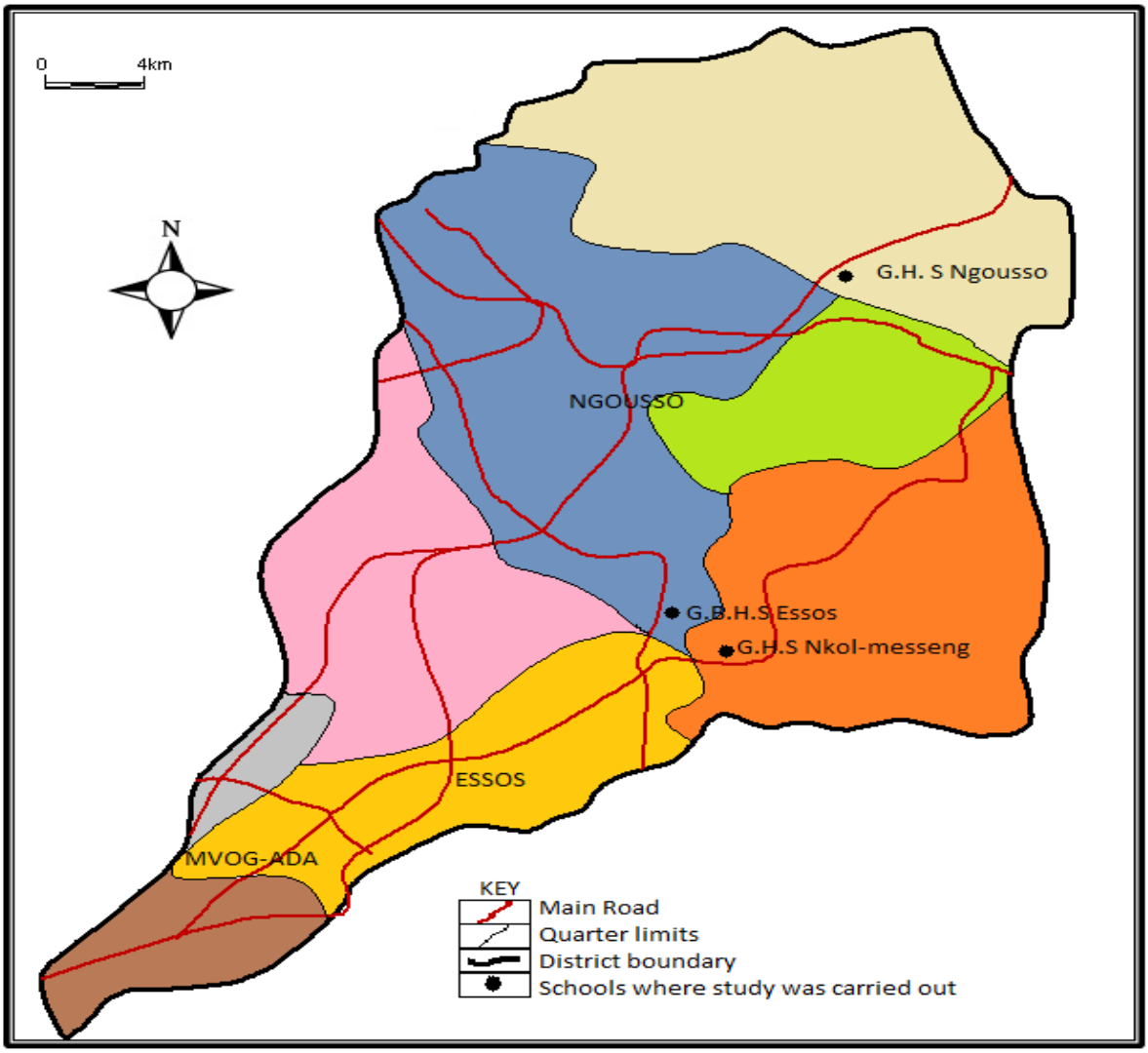
Yaounde V municipality is located in the Centre region of Cameroon at Mfoundi division. All the government secondary schools in this area constitutes the target or mother population of this research work. This municipality was created by Presidential Decree No. 93/321 of 25 November 1993. It is located in the Centre region at the Mfoundi division. Mfoundi division forms the capital of Yaounde with a surface area of 297 km^2 out of which a great square kilometres are urbanized. Yaounde V is therefore bounded to the north by the Yaounde 4 (IV) municipality, to the east by Soa and Nkol-Afamba (Mefou and Afamba division), to the West by the Yaounde three (III), and to the South by Yaounde 1 municipality (see figure 1). Here in this municipality, we have Government Bilingual High school (G.B.H.S) Yaounde, Government High School Nkolmesseng, and Government High School Ngousso-Ngoulmekong which are areas of interest to this research work.

Government Bilingual High school Yaounde is the very first Bilingual government secondary school in Yaounde. It is situated at Essos quarter in the TSOUNGU OLOA road in

the kong locality. It is situated some kilometres away from the Nkol-Ebogo, Nkol-Messeng Mvog-Ada, and Nkol-Foulou quarters. G.B.H.S Yaounde is therefore in Yaounde V, Mfoundi Division of the center region of Cameroon. It is also important to note that it is sharing boundary with Government High School Nkolmesseng which was newly created some few years back. Government High School Nkolmesseng is found at the Eponyme neigbourhood and shares the same site with G.B.H.S Yaounde. It is therefore located in Yaounde V municipality of Mfoundi Division in the Centre Region of Cameroon.

Government High School Ngousso-Ngoulmekong on it part, is located at Ngoulmekong at the Foujerole neighbourhood at the. Yaounde- Soa road. It is also located in Yaounde V municipality of Mfoundi Division in the Centre Region of Cameroon.

Figure 1: Map of Government Secondary Schools in Yaounde V Municipality.



SOURCE: Adapted from the Yaounde V municipal web site.

1.1.2. Population Size

The enrolment of Government Bilingual High school (G.B.H.S) Yaounde soared 6000 students for the 2016-2017 academic year, managed by a Principal, Vice Principals, Senior Discipline Masters, technical Chiefs of Service, Support staff, Government and part time teachers. It has 285 teachers (133 for the Anglophone section and 152 for the Francophone section), 15 Guidance Councillors, 77 administrative and technical staff, and 29 Contract staff. In terms of population, this school is one of the biggest government secondary school not only in Yaounde V municipality where our study is focus but in the entire Yaounde Region.

Government High School Nkolmesseng which is one of our target schools, has a population of 959 students and 81 teaching and administrative staff. It is the less populated government secondary school in Yaounde 5 municipality.

Government High School Ngousso-Ngoulmekong has a total population of 4500 students and 200 teaching and administrative staff. It is the second populated government secondary school in Yaounde 5 municipality after G.B.H.S Yaounde.

1.1.3. Structure

The government secondary schools that makes up our target population of study differs in their structures. Government Bilingual High school Yaounde which is the largest, has two complete sections constituting the Anglophone and Francophone Sections. It structure covers large hectares of land in which 78 classrooms are constructed. There are 34 classrooms for the Anglophone section and 44 for the Francophone section. There is also an administrative bloc consisting of the Principal's office, the secretariat, staff room, and offices the Vice principals. Beside this bloc is another where we have the school Library and some offices. Another structure made up of a school hall, a canteen and some offices. Modern toilet are constructed for both teachers and students. The school has 01 multimedia Center having 02 computer halls and 02 offices. Also, there are 02 Computer classrooms. The school can boast of a total number of 160 computers, 04 projectors, 01 video camera, 02 scanner and 04 printer at the services of both teachers and students. And also, 03 computer for the school secretariat and the Principal's office.

Government High School Nkolmesseng is made up of Francophone section only. It shares boundary with G.B.H.S. Yaounde. It has just 03 levels because its creation dates 03years back. Each level has 05 classrooms. The school therefore has 02 main bloc story buildings in which we have 15 classrooms, 21 offices, 01 staff room, 01 Library and 01 computer hall with

30 machines at the services of all the students during their computer practical lesson. There is also 01 Sanitary Bloc for the students and modern toilets for all the staff.

Government High School Ngousso-Ngoulmekong has just the Francophone section. It has enough land that permits the construction of 05 main bloc buildings consisting of 48 classrooms, 02 computer halls with 70 computers for practical lessons in Computer, a staff room, some offices for the Vice principals, administrative staff and the administrative bloc. There are modern constructed toilets for students as well as the school staff.

Although there is no multimedia center in this school, the availability of two computer classrooms equipped with 70 computers, enables the practical teaching of this ICT.

1.1.4. Function

The three institutions which comprised our target population aimed at training the young minds for a better Cameroon. They are under the management of Principals, Vice Principals, Senior Discipline Masters, technical Chiefs of Service, Support staff, Government teachers, and part time teachers paid by the Parent Teacher Association (The PTA). Just like any other government secondary school in Cameroon, they follow the General Secondary Education program designed by the Cameroon Ministry of Secondary Education for both the French and English sub systems of education.

The main aim for the creation of G.B.H.S Yaounde was to promote bilingualism in Cameroon. It is benefiting from a special regime as it trains French-speaking and English-speaking students. Contrary to Government High School Nkolmesseng and Government High School Ngousso-Ngoulmekong, the students of G.B.H.S Yaounde are prepared for the examination of the Anglophone sub-system GCE and the Francophone sub-system BEPC (Brevet d'Étude du Premier Cycle), Probatoire and Baccalauréat général. The English sub-system takes five years for the first cycle after which the General certificate of Education – Ordinary Level (GCE O/L) certificate is obtained. Two years of High School (second cycle) follows after which the General certificate of Education - Advanced Level (GCE A/L) is obtained. While the French sub-system lasts for 4 years for its first cycle and BEPC certificate obtained. Three years of second cycle follows after which Probatoire and Baccalauréat général certificates are obtained. These two systems thus exist separately and maintain different evaluation methods as well as certification.

Through the integration of ICT as a discipline, this school train students who will be professionals in ICT in future thus making the Cameroon digital economy a reality. This is because through ICT, students develop skills that permit them at the end of their studies to be self-employed and digitally switched over into the working population for better products. We also observed this same initiative in Government High School (G.H.S) Nkolmesseng and in Government High School (G.H.S) Ngousso-Ngoulmekong though in theory. This is because these schools are gradually growing in the ICT domain and not yet equipped with a multimedia centre as the case in G.B.H.S. Yaounde.

Unlike G.B.H.S Yaounde, G.H.S Nkolmesseng and G.H.S Ngousso-Ngoulmekong prepare students only for one sub-system of education as they adopt the French-speaking sub-system of education. This system grant 4 years of middle school training to students after which a BEPC certificate is obtained and 3 years of High School after which Probatoire and Baccalauréat général certificates are obtained

The promotion of bilingualism is very effective in both G.B.H.S Yaounde and G.H.S Ngousso-Ngoulmekong given the special Bilingual series they offered to their students. This is not the case for G.H.S Nkolmesseng since it is still very young (3years old) with just three levels (5^{eme}, 6^{eme} and 4^{eme}).

Conclusively, we have three government secondary schools located in Yaounde V municipality including; G.B.H.S Yaounde, G.H.S Nkolmesseng and G.H.S Ngousso-Ngoulmekong. In terms of population, G.B.H.S Yaounde comes first with 6000 students and 285 teachers for 2016-2017 academic year, G. H. S Ngousso-Ngoulmekong followed with a total of 4500 students and 200 teachers and finally G.H.S Nkolmesseng with 959 students, 81 teaching staff and just three years since its creation. Apart from the population classification, we have equally seen the different structures and functions of the three schools where we have similar and divergent aspects.

This chapter will examine the Creation and Growth of government Schools in Yaounde V and the Teaching-Learning Methodology before and during the integration of ICT in these Schools.

2.2 Historical development

The three government Schools located in Yaounde 5 Municipality have unhique historical background. From the time of creation, they all registered gradual growth in due" time. This is subsequently presented for a better understanding of our target population.

2.2.1 Creation and Growth of government Schools in Yaounde V

Government Bilingual High school Yaounde was created in 1973 by the presidential degree n°73/280 of 02/06/1973. The institution later opened its doors in 1977 with the second cycle only following a Ministerial Decision n°171/A/31/MINEDUC/DESG/DETP/DEPM of 14/09/1978. Later in 1985, the first cycle became functional with limited number of students. It is therefore matriculated under n°5LJ1GSBD110162078.

G.H.S Nkolmesseng on its part, is the youngest government secondary school is Yaounde 5 Municipality since it is just three year old. It was created on the 12th of July 2010 following degree n°2010/2044/PM of the Prime Minister. This institution therefore opened its doors in 2014 following a Ministerial Decision n°381/14/MINESEC/CAB on the 9th of July 2014.

G.H.S Ngousso-Ngoulmekong, is a government school that was created in 1995 and opened its doors two year after in 1998 to the first class (6eme). It was first called "Lycee de Ngousso", then later "Lycee Ngousso-Ngoulmekong" after it got operational in 1998. Its matriculation number is n°5LJ1GSFD110037098.

2.1.2. The evolution of government Schools in Yaounde V

The growth or evolution of government secondary schools in Yaounde 5 differs given their unique creation and history. G.B.H.S.Yaounde, is the very first government secondary school created in Yaounde town. The main objective of its creation was to promote bilingualism in Cameroon. After it creation, it started exclusively as a second cycle institution. The Anglophone section had the Lower and Upper sixth classes while the Francophone section had 2nde and TLe. It was in 1985 that the entrance examination into 6eme and Form 1 was lunched. After this, 5 classes for 6eme and 4 classes for Form 1 were opened for 1985-9186 academic year. In due time, more classrooms were constructed for the new classes given that each year students moved from lower to higher classes.

Gradually, by 1990, G.B.H.S. Yaounde had a complete cycle (First and Second Cycles) in all the sections and able to prepares students for the exams of the Anglophone sub-system GCE and the Francophone sub-system BEPC, Probatoire and Baccalauréat général. In 2001, a Multimedia Resource Center was inaugurated in this school by the Presidential couple his Excellency Paul Biya and Mme Chantal Biya (See Figure 3). This Center is used for ICT practical lessons and official Examination of G.C.E, Probatoire, and Baccalauréat. It can today boast of some innovations at the level of a good number of new machines, the N-Computing solution added in the construction and equipment of the second computer hall (classroom). In

the course of time, certain series such as Information Technology (TI) and Italian language (Ita) were added into the school program in 2012. This lead to the construction of additional classrooms for the purpose. Two year after the integration of these subjects, a special Bilingual education programs (SBEPS) was integrated in the school. Classes for this program were opened in September 2014 starting with the 6eme and Form 1 Bilingual. The first batch of students for this special program are now in Form 3 (5eme) bilingual. Since its creation till date, this school has trained and is still training many young Cameroonians.

There is a Parents Teachers Association (P.T.A) in G.B.H.S. Yaounde which has been very influential in its growth. This association aimed at the welfare and development of students and school in general. Through their contributions, the school was able to construct additional classrooms which has actually facilitate the teaching-learning activity.

In the case of G.H.S Nkolmesseng, it growth just like that of all the other government Secondary schools in Yaounde 5 is different because it is as well unique in its creation and history. It was created in 2010 by a Ministerial degree and became operational in 2014 with just five 6eme classes. It practiced the Francophone sub-system of education and thus progressively preparing students for the BEPC, Probatoire and Baccalauréat général examinations. The three years of it existence has led to the creation of 15 classrooms given that each level has five classes. Five classrooms for the 6eme, 5eme, and 4eme classes. This school went operational when the modernising nature of Cameroon through the integration of ICT into schools was the order of the day. This therefore explain why ICT was integrated into the school program from the very first beginning. Though the school do not have a Multimedia Centre, the available computer hall with 30 machines facilitate the practical lessons on ICT (See Figure 4).

The evolution of Government High School Ngousso-Ngoulmekong is no left out. After it creation in 1995, the structure of the school had to be put up at Ngousso and named as G.H.S Ngousso. This original plan was not respected due to lack of land to construct the school. It was finally constructed at a nearby village called Ngoulmekong thanks to their notables notables who provided a piece of land for this purpose. The first academic year 1998-1999 kicked off two year after it creation with the 6eme class. The name of the school was then changed from G.H.S Ngousso (Lycee de Ngousso) to G.H.S Ngousso-Ngoulmekong (Lycee Ngousso-Ngoulmekong) because the site of the'school was shifted to the Ngoulmekong neighbourhood. This school therefore prepare students for the BEPC, Probatoire and Baccalauréat général examinations. The first batch of students wrote their Baccalauréat examinations in 2005 making the school a complete secondary cycle. Just like any other secondary schools in Yaounde, G.H.S Ngousso-Ngoulmekong integrated ICT into the school curriculum so as to meet up with the

demands of this 21st century era. Although there is no multimedia center in this school, the availability of two computer classrooms equipped with 70 computers, enables the practical teaching of this ICT. (See Figure 5).

Although our observation show that only one school out of the three researched on has a MRC, efforts are made for ICT to be fully integrated in these schools. It is therefore thanks to the involvement of Cameroon Government in the area of ICTs that we have the setting up of Multimedia Resource Centres in some secondary schools such as Government Bilingual High school Yaounde, and other secondary schools in Cameroon. It is important to note that official ICT programmes for secondary schools were conceived by 2003 [136] and also ICT syllabuses and National Sequential Schemes of work published in 2008 were made available to Nursery, Primary and Teacher Training Education. The strategy targeted at training teachers and head teachers in the importance and how to use ICTs in teaching and learning and in school administration. Based on training objectives, national guidelines were also included in the teaching of ICTs in preschool and primary schools. The guidelines were based on six modules for each level including the skills to develop which were: the discovery and presentation skills, application skills, knowledge construction skills, health and safety issues related to ethics and equity[137].

Furthermore, it is worth noting that the field of Computer Science and Educational Technologies established in Cameroon schools has as objective to train general secondary school ICT and Computer Science teachers. Apart from government initiatives, non-governmental organizations like ADCOME have also contributed at regional levels to bridge the digital divide in secondary schools in the southwest region of the country through their Computer and Internet Access Centres project. ADCOME's initial objective was to bring internet closer to the people at low cost in the year 2000[138]. In 2001, motivated by the achievement of this objective, it further launched the Computer and Internet Access Centres project to install computers and internet as well as providing training for teachers in secondary schools.

[136] ERNWACA-Cameroon, Integrating ICT in Education in West and Central Africa, A Study of Pioneer Schools inCameroon,Yaounde,Cameroon,ERNWACA-Cameroon,2005. www.rocare.org/Rapportfinal_TICICM2005.pdf

[137] République du Cameroun, Stratégie nationale de développement des technologies de l'information et de la communication. Yaoundé, Cameroun, Agence nationale des technologies de l'information et de la communication (ANTIC), 2007c, p.3. www.observatoiretic.org/documents/show/87

[138]

The Ministry of Secondary Education just like other institutions in charge of ICT Education in Cameroon have been carrying out remarkable projects since the introduction of ICTS in schools. This Ministry has been opening multi media centres and can now boast that, 80 per cent of secondary schools have computer rooms and 60 per cent have computers.

2.2. Teaching-Learning Methodology before and during the integration of ICT

The Cameroon educational system is currently in its third phase of evolution since independence. The first phase started from Independence to 1996 known as the Content-Based Approach, the second phase from 1996 to 2012 called the Objective-Based Approach and the last phase started from 2012 to present date known as the Competency-Based Approach

2.2.1. Content-Based Approach

This approach is one of the oldest in the Cameroon educational system and is dated from Independence to 1996. In this approach, teachers are the main authority figure and students are viewed as "empty vessels" whose primary role is to passively receive information (via lectures and direct instruction) with an end goal of testing and assessment. It is the primary role of teachers to pass knowledge and information onto their students as student learning is measured through objectively scored tests and assessments. The focus here was therefore on content or subject matter since the lecture and notes-giving or passive methods are methods commonly used by teachers. As for lecture, the teachers simply presented information to learners who sat quietly and listen with minimal or no interaction. Sometimes learners were expected to take down notes as the teacher talked and sometimes teachers give lengthy summary notes. They also asked questions at given intervals and appoint students to answer. Although this method took care of large classes and was time-effective during lesson preparation and delivery, it was teacher-centered. The method bred passive learners who were considered as empty vessels to be filled and non-contributors to the development of knowledge, attitudes and skills. Learners often get bored, disinterested, and inattentive. Even when lectures are broken by intervals of question, effective learning did not take place because apart from the answers the provided, students did not contribute to the elaboration of the lesson.

It is important to note that what poses problem with the lecture method is the degree in which it is used. When combined with other methods it can engender effective teaching-learning. For instance, lecture could be used in presenting background information, introduction of an aspect of a lesson, focusing learners' attention and rounding off a lesson or an activity.

Meanwhile, in the notes-giving method which is another characteristic of this Content-Based Approach, teachers either by themselves or through the class head dictated or wrote notes on the chalkboard. Also, they summarily lecture for about 5 or 10 minutes and gave notes for the rest of the period. This method was teacher-centred and has negative results on learners and effective learning.

This content-based approach (teacher-centred) is therefore a teaching-leaning approach that was applied in the Cameroon educational system long ago before the integration of ICT. This approach did not know the integration of ICT throughout its application. It had some shortcomings which became necessary that something be done thus leading to the transition from the content-based approach to the Learner-Centred Approach (LCA).

2.2.2. Objective-Based Approach

This approach in Cameroon is dated from1996 to 2012 given that it was introduced into her educational system 5 years (1996) before the integration of ICT in Cameroon public schools in February 2001. In 1996, the Ministry of Secondary Education introduced the Learner-Centered Approach (LCA) based on teaching-learning by objectives. This meant that general and specific objectives must be defined and outlined for every topic and lesson, respectively. Students should be able to show proof of having learnt X, Y, or Z by the end of the module, topic or lesson. Lessons should be learner-centered (interactive), with the aid of a number of active methods. The LCA consists in placing the learner at the center of the pedagogic process. The teacher is a guide, facilitator, creator of opportunities for student participation so that they can effectively learn. He or she aim at adjusting teaching methods to facilitate the achievement of the stated objectives. If the teacher is honest, he or she may well conclude that the methods adopted have only a remote chance of enabling students to attain some of the stated objectives and take appropriate action. A teacher is therefore in a much better position to decide how objectives may be assessed, since he or she should know exactly what behaviour they are supposed to be assessing. This approach not only forces teachers and institutions to think deeply about what they are trying to achieve, but, in many cases, also makes them take the first step towards a systematic approach to course design and course monitoring.

Using an objectives model enables the construction of assessments which can be designed against the learning objectives. The objectives model is a systematic approach to course planning. It forms part of Outcomes Based Education (OBE) which states that "educators should think about the desirable outcomes of their programmes and state them in clear and precise terms. They should then work backwards or 'design down' in the jargon of

OBE, to determine the appropriate learning experiences which will lead to the stated outcomes. By using an outcome approach, educators are forced to give primacy to what learners will do and to organise their curricula accordingly"[139].

In order to render this approach effective, hierarchy requested that hitherto voluminous and ill-adapted syllabuses be realistically revised, trimmed-down and streamlined to permit for adequate student-centered activities. Late Minister Louis Bapes Bapes stressed this point, for emphasis, at a national seminar of pedagogic inspectors at GTHS Nkolbisson on September 26, 2012. And so, today some syllabuses have been rid of about half or more of their former bulk.

This Objective-Based Approach has its shortcomings just like the content-based pedagogy. The most important weakness of this approach to teaching-learning is that the learner is able to do many things separately; diverse knowledge and activities are not knitted, interwoven and blended together enough into values, attitudes, life skills or aptitudes that would make learners competent in the face of life's situations or challenges. Also, a total concentration on the achievement of clearly-defined objectives may lead to the production of students who are certainly well-trained in specific areas, but who lack the broad spectrum of abilities, skills and desirable attitudinal traits that are normally associated with a balanced, 'rounded' education.

2.2.3. Competency-Based Approach (CBA)

This teaching-learning approach overcomes limitations identified in the Objective-Based Approach and is dated from 2012 to present date in Cameroon. This approach therefore came into effect 11years (2012) after the integration of ICTs in Cameroon public schools in February 2001. The CBA to learning was introduced in 2012/2013 academic year in the educational system of Cameroon. By introducing this approached it was hoped that teachers would teach using a more integrated approach that will help pupils become more competent learners. The CBA targets the inculcation of values, attitudes and the development of life skills and a positive transformation of perceptions and behaviour which makes the learner effective, acceptable in society, useful to themselves and to society. By virtue of their learning, they are functional literates in the face of life situations. The CBA is essentially an old way made more manifest, more conscious, purposeful and systematic based on characteristics such as: The teacher is not the only holder of knowledge and know-how in a class; The role of the teacher in the development of the student's functions, abilities and potentialities is to help the development of the various functions; The teacher gives priority to activity and understanding during the

[139] Prideaux, 2000

learning process; The teacher is an educator, a trainer of the child's .habits, virtues, and qualities; The teacher takes into account the needs, realities and points of view of the child; There is preparation for autonomy and responsibility. In view of these characteristics, the learner has to be the craftsman of his own knowledge by actively participating in the teachings for which he is destined. As for the teacher, he is only a guide, a facilitator during the teaching-learning process and no longer the one who holds the monopoly of knowledge vis-a-vis pupils who are considered as passive receivers.

The Objective-Based Approach is still evident in the Cameroon classrooms today because, the CBA went into Form two as from the start of the academic year 2015/2016. It is important to note that the OBA and CBA belong to the LCA and both avail themselves of the same set of LCA methods and techniques. The only difference is that the CBA is of a higher level given that it is an approach more often used in learning concrete skills than abstract learning. It differs from other non-related approaches in that the unit of learning is extremely fine grained. Learners work on one competency at a time, which is likely a small component of a larger learning goal. The student is evaluated on the individual competency, and only once they have mastered it do they move on to others. After that, higher or more complex competencies are learned to a degree of mastery and isolated from other topics.

It is also important to note that before 2012 in Cameroon, social science teachers had been timidly and unconsciously applying the CBA. This CBA just like the integration of ICT in education is a student-centered approach. This is explain by the fact that the use of ICT in education lends itself to more student-centered learning settings and often this creates some tensions for some teachers and students. The skills and competences of the 21st century teachers and learners can thus be realized through the CBA given that it is learner-focused and works naturally with independent study and with the instructor in the role of facilitator.

There is no clean boundary between the Competency-Based Approach and the preceding Objective-Based Approach. This is because every lesson under the CBA still has objectives even if they are coined differently and referred to as "justification" of the lesson, instead of "objectives". The basic different here is at the level of the outcomes. Although both Competency and Objective-Based approaches aim at increasing efficiency in teaching and learning, offering well-structured educational activities oriented toward training goals, they significantly differ in their teaching, learning and assessment methods. The competence-based approach rests on cognitive models of competency development. The approach favours competence development acquired from authentic situations and complex problems. It

encourages the development of reflective professional practice with help from mentors who provide feedback.´

Summarily, examining the creation, evolution and the Teaching-Learning Methodology before and during the integration of ICT in the said three Government Secondary Schools gives us an insight of our studied area. G.B.H.S Yaounde was created in 1973 but went operational in 1977, while G. H. S Ngousso-Ngoulmekong was created in 1995 and started functioning in 1998 while the youngest G.H.S Nkolmesseng was created in 2010 and opened its doors in 2014 (three years of existence). Being a bilingual school, G.B.H.S Yaounde started as a second cycle with Lower, Upper sixth and 2^{nde}, T^{Le} classes. In 1985, 6^{eme} and Form 1 were opened and it progressively move from one level to the next every after one academic year. In 2012, TI and Ita were added into the school program and two year later SBEPS was also integrated. Meanwhile after going operational, G. H. S Ngousso-Ngoulmekong on it part, move gradually from inferior to superior level after every each academic year. ICT and SBEPS later have their way into the school curriculum. Whereas G.H.S Nkolmesseng started with 6^{eme} classes and can now boast of 6^{eme}, 5^{eme}, and 4^{eme} classes. ICT was integration same year (2014) it started functioning. Just like G. H. S Ngousso-Ngoulmekong, it practiced the Francophone sub-system of education. The educational system of these three schools just like any other school in Cameroon, is currently in its third phase of evolution since independence. It has evolved from the Content-Based, Objective-Based, and Competency-Based Approaches implemented in all secondary schools in Cameroon.

PART TWO

AVAILABLE INFORMATION AND COMMUNICATION TECHNOLOGY TOOLS IN SCHOOLS AND THEIR UTILISATION

CHAPTER THREE
ACCESS OF ICT TOOLS AND THEIR FACILITIES TO BOTH STUDENTS AND TEACHERS

Having access to ICT tools is important in diffusing ICT in education[140]. ICT tools are devices and objects used in information and communications technology such as computers, cell phones and cell phone towers, televisions, video conferencing software, radios, laptops, DVDs, etc. In reality, the integration of ICT in Cameroon secondary schools is focused on limited number of computer programs and the available ICT tools to both teachers and students. One of the major problems facing schools in their quest to integrate ICT in schools is lack of ICT facilities. Howell and Lundall reveal that lack of sufficient funds and inadequate numbers of computers are impeding ICT diffusion into different subject areas. They further asserts that unreliable supply of electricity, and insufficient accommodation capacities are also inimical to integration of technology in education in most schools in Africa[141]. This chapter will thus presents and analyse the Multi-media centre and Computer Halls in the different Schools concerned as well as the available ICT tools and their uses within and without the school premises.

3.1. Multi-media centre and Computer Halls in Schools

One cannot talk of effective integration of ICTs in Cameroon educational system without multimedia resource centers and school computer halls. A better understanding of the accessibility and facilities of ICT in Yaounde Five (V) government secondary schools is therefore seen in the available Multimedia Resource Center in G.B.H.S Yaounde, and school computer halls in G.H.S Ngousso-Ngoulmekong and G.H.S Nkolmesseng. These infrastructures are put in place to make the integration of ICT easier (See Table 3).

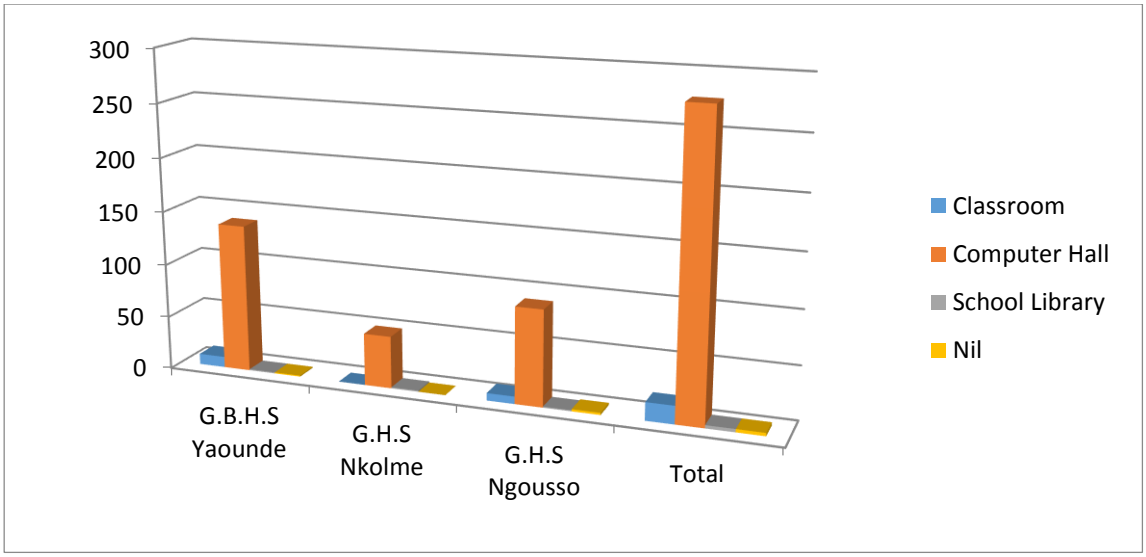
[140] Norris et al., 2003.
[141] Howell and Lundall 2000

Table 1. Presentation of sample according to ICT infrastructures in schools

Where Students often use ICT	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Classroom	10	6,7	0	0	7	7	17	5,7
Computer hall	138	92	49	98	90	90	277	92,3
School library	1	0,7	1	2	1	1	3	1
Nil	1	0,7	0	0	2	2	3	1
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

Figure 2. Presentation of sample according to ICT infrastructures in schools



Source: The students, from field investigation, May 2017

From the above table and the Bar chart that follows, we noticed that out of our sample of 300 students, 277 of them stood for the idea that the computer Hall is the ICT infrastructure where they make use of ICT tools in their schools. This gave us a total of 92,3% from all the three schools involved. Meanwhile, 17 out of the total sample responded that the classroom is where they make use of the said ICT tools, giving us 5.7% and just 1% stood for the school Library as well as those who adopted an indifferent attitude.

From our observation, we can therefore conclude that in all the three schools visited, computer halls are where students make use of ICT tools in their various schools. In G.B.H.S Yaounde 92% of 150 students affirm this fact as well as 98% of 50 students in G.H.S Nkolmesseng and 90% of 100 students in G.H.S. Ngousso-Ngoulmekong. Those interviewed from G.B.H.S Yaounde asserts that "ICT tools in school are used in both computer Lab. and the Multimedia Resource Centre (MRC)"[142] The availability of computer halls in the said schools is therefore an important element which facilitate ICT integration. In effect, this ties partly to the secondary hypotheses one (H1) of our research work which states that **ICT is implemented in Government Secondary schools in Yaounde V through necessary elements put in place to facilitate the integration of this innovation.** The available computer halls signifies the presence of computers. We therefore observed the availability of computers and some ICT tools which facilitate the integration of ICTs in these schools thereby validating our secondary hypotheses one (H1) as shown in the calculated chi-square in table 4.d.

Table 2.a. Description of sample according to the Use of ICT tools in school

ICT tools are used in school	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Yes	148	98,7	49	98	99	99	296	98,7
No	2	1,3	1	2	1	1	4	1,3
Total	150	100	50	100	100	100	300	100

Table 2.b. Description of sample according to opinion on the types of ICT tools used

Opinion on the use of Computers, Internet and projectors in school	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Strongly Agree	127	84,7	39	78	79	79	245	81,7
Agree	3	2	1	2	2	2	6	2
Disagree	20	13,3	10	20	19	19	49	16,3
Total	150	100	50	100	100	100	300	100

Source: Author, from field investigation, May 2017

[142] H.O.D of Computer Science and Monitors, Interviewed, G.B.H.S Yaounde, 10/05/2017

From the above tables we are able to validate our secondary hypotheses one (**H1**) which states that: **ICT is implemented in Government Secondary schools in Yaounde V through necessary elements put in place to facilitate the integration of this innovation.**

It is therefore observed that a total number of 296 out of 300 students agreed that ICT is used in their school thus giving a percentage rate of 98,7% . On the other hand, 4 students refused this fact, giving us an insignificant rate of 1.3% (See Table 4.a.). Further seeking the students' opinions on the use Computers, Internet and Projectors in their school (ICT tools), gave us a total percentage rate of 81,7% who strongly agreed that these tools are used in their school while 2% agree contrary to just 16.3% who totally disagree to this fact. From this, we came up with a contingency table from which a chi-square value was calculated as shown below.

Table 2.c. Contingency Table for Hypothesis One (H1): ICT is implemented in Government Secondary schools in Yaounde V through necessary elements put in place to facilitate the integration of this innovation.

H1	Strongly Agree	Agree	Disagree	Total
Yes	245	5	46	296
No	0	1	3	4
Total	245	6	49	300

Source: Author, from field investigation, May 2017

This table shows the description of sample according to opinion on the different types of ICT tools used. In order to calculate the Chi square (X^2) values, the Expected frequencies are required. The formula for Expected frequency (E) is: $E = \frac{tr \times tc}{N}$

Where tr = Total frequency of rows, tc = Total frequency of columns, and N = Total number of observations (sample size).

Table 2.d. Calculation of Chi square (X^2) value for Hypothesis One (H1)

Observed (O)	Expected (E)	O-E	$(O-E)^2$	$(O-E)^2/E$
245	241,7333	3,266667	10,67111	0,044144144
5	5,92	-0,92	0,8464	0,142972973
46	48,34667	-2,34667	5,506844	0,113903291
0	3,266667	-3,26667	10,67111	3,266666667
1	0,08	0,92	0,8464	10,58
3	0,653333	2,346667	5,506844	8,428843537
Chi Square (= sum of $(O-E)^2/E$)				22,57653061

Source: Author, from field investigation, May 2017

The Chi Square formula is given by: $X^2 = \Sigma \frac{(O-E)^2}{E}$

Where O = Observed frequency, E = Expected frequency, and Σ = Sum of.

From table 4.d above, we noticed that the X^2 calculated is equal to 22,58. To read the critical value, it is necessary to calculate the degree of freedom (df) using the formula: (df) = (r-1) (c-1). Where (r) = Number of rows, (c) = Number of columns.

Therefore our (df) = (c - 1) (r - 1) = 2(1) = 2

Therefore the X^2 critical value at 0.05 level of significance, with 2 (df) is 5.991.

To draw our conclusion, we must verify what the decision rule says.

Decision Rule:

i) If the X^2 calculated is greater than X^2 critical value (X^2 cal. > X^2 crit.), reject the null hypothesis (Ho).

ii) If the X^2 critical value is greater than X^2 calculated (X^2 crit. > X^2 cal.), retain the null hypothesis (Ho).

Back to our analysis above, we observed that the X^2 calculated (X^2 cal.) 22,58 is greater than the X^2 critical value (X^2 crit.) 5.991. That is, (X^2 cal. > X^2 crit.). We therefore reject the null hypotheses (Ho) thus validating our Hypotheses one (H1) which states that: **ICT is implemented in Government Secondary schools in Yaounde V through necessary elements put in place to facilitate the integration of this innovation.**

After validating our first hypotheses it was necessary that we rate the frequency of students to their school computer halls. Reason being that through this we could determine whether or not there is effective implementation of ICT in the said schools (See table 5).

Table 3. Description of sample according to frequency of visit to school Computer Hall

Frequency of visit to the School Computer Hall	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Once a week	117	78	43	86	80	80	240	80
Thrice a week	25	16,7	6	12	11	11	42	14
Twice a week	2	1,3	0	0	3	3	5	1,7
Daily	0	0	0	0	1	1	1	0,3
Nil	6	4	1	2	5	4	12	4
Total	150	100	50	100	100	100	300	100

Source: Author, from field investigation, May 2017

From the above table, 240 out 300 students stood for the idea that they frequent their school computer hall once a week giving us 80%. This high percentage apply to all the schools given that in G.B.H.S Yaounde, 78% of 150 students stood for this idea, 86% of 50 students in G.H.S Nkolmesseng, and 80% of 100 students from G.H.S Ngousso-Ngoulmekong all responded that they visit their School Computer Hall just once in a week. On the other hand a total of 42 students from the general sample size (300) responded that they visit their School Computer Hall three time in a week, giving 14%. Meanwhile an insignificant 1,7% stood for two times in a week, and 0,3% for every day although 4% ignored this question.

This observation draw us to a conclusion that, effective implementation of ICT in these schools is still questionable generally touch computers in schools just 4 times in a month. This just confirms the general preoccupation we got through our semi-directive interview with Heads of Department (H.O.Ds) of computer science in all the schools in question. This worry was based on the fact that their school program do not give enough time for students to frequently visit computer halls (Computer Lab. / Multimedia Resource Centre) for their practical lessons. At this point during our interview, these H.O.Ds went to the extent of recommending that for effective integration of ICT to be realised, the schools should be provided with more computers, computer halls, M.R.C, and internet.

Furthermore, we observed that although limited time was allocated for computer practical, students of the examination classes were programmed twice or thrice a week to the computer hall[143]. This thus explain why a total of just 14% and 1,7% (Students from examination classes) from the table, responded that they visit their computer hall two and three time in a week. It is therefore necessary to look at the computer halls of the different targeted schools.

3.1.1. Government Bilingual High School Yaounde

Infrastructure and training have great influence on the access and facilities of ICT to teachers and students. Alluding to the infrastructure of Government Bilingual High School Yaounde, the Multimedia Resource Centre for Information and Communication Technology (ICT) that will soon witness the incorporation of the digital version of education programme, was inaugurated on 30 November 2001 by His Excellency Paul BIYA, President of the Republic of Cameroon; and his wife Mrs. Chantal BIYA, founder of African Synergy (See Figure 3). This inauguration was done in the presence of the Minister in charge of National

[143] Gang, F. D, Interviewed, G.B.H.S Yaounde, 10/05/2017; Mme Ogeune, Interviewed, G.H.S Ngousso-Ngoulmekong, 04 /05/ 2017.

Education. This Multimedia Resource Centre is has two (02) computer halls with two (02) offices. Also, there are two (02) Computer classrooms, all available for practical computer lessons. G.B.H.S Yaounde can boast of a total number of 160 computers, 04 projectors, 01 video camera, 02 scanner and 04 printer all at the services of both teachers and students. Also, there are three (03) computers for the school secretariat and the Principal's office[144]. This M.R.C has been a pilot centre for Information and Communication Technology in the Republic, which sufficiently served the student population at the time, prior to the decentralization of the programme.

Figure 3: G.B.H.S. Yaounde and the Multimedia Resource Centre/Computer Hall

Source: Author, from field investigation, May 2017

Infrastructure is not the only factor to consider in accessing ICTs. The necessary skills for use are also needed (Djeumeni Tchamabé, 2010 and Palamakumbura, 2009) and this is

[144] Djeugang A., Interviewed, G.B.H.S Yaounde, 10/05/2017.

possible through training. From what was observed at the level of teachers, the fear of using a computer is broken by basic training as seen in G.B.H.S Yaounde. All teachers of this institution each owned an account through which they type and register their sequential marks. Although training of teachers require more than that, almost all the teachers are obliged to do practice this exercise of sequential marks filling at the school Multimedia Resource Centre (M.R.C) thus appropriating information technology (IT).

From what was observed in all the government secondary schools found in the Yaounde 5 municipality, G.B.H.S Yaounde is the only government secondary school having a Multimedia Resource Centre (M.R.C). The teaching of ICT in other schools is made possible by the availability of school computer halls equipped with some computers.

3.1.2. Government High School Nkolmesseng

Access of ICT tools and their facilities to both students and teachers in Government High School Nkolmesseng, is observed through the availability of a computer classroom (Computer Hall) as seen in figure 4 below. Unlike G.B.H.S Yaounde, this school has just a computer classroom where the practical lessons for ICT takes place with respect to a drawn timetable. Just like the majority of students in the other schools (G.B.H.S Yaounde and G.H.S Ngousso-Ngoulmekong) students of G.H.S Nkolmesseng visit their computer hall once in a week for practical ICT lessons (See table 5) .Their computer classroom is equipped with thirty (30) machines at the services of all the students during the ICT practical lessons. The school has therefore programmed this in such a way that each students has the opportunity to take part in practical lesson. Students' access to the computer hall for practical lesson is not enough for us to talk of effective integration of ICT. According to Mvolo née Atangana T., "…limited number of computer and lack of internet connections makes it difficult to fully integrate ICT in my institution"[145]

[145] The Principal, Interviewed, G.H.S Nkolmesseng, 03/04/2017.

Figure 4: G.H.S Nkolmesseng and the Computer Hall

Source: Author, from field investigation, May 2017

We therefore observed that even though this institution is still very young (3years old) as compared to other schools, the students perform very well in ICT. This was confirmed by Tsayem A.S. (H.O.D) who asserts that "my students perform very well. Success rate has always been between 80 to 95% despite the fact that just 30 machines available for 959 students"[146].

3.1.3. Government High School Ngousso-Ngoulmekong

Access of ICT tools and their facilities to both students and teachers in Government High School Ngousso-Ngoulmekong, is observed through the availability of two computer Halls. Just like in Government High School Nkolmesseng, the practical lessons for ICT is made

[146] Tsayem A.S. Interviewed, G.H.S Nkolmesseng, 09/05/2017

possible through these computer classrooms. The computer classrooms are equipped with a total of seventy (70) computers. The visit of students into this school computer hall is programmed by the school such that each student has the opportunity to take part in the practical computer lesson. From our observation, all the students have the opportunity to visit their computer Halls once in a week for ICT practical lessons (See table 5).

Figure 5: G.H.S Ngousso-Ngoulmekong and the Computer Halls

Source: Author, from field investigation, May 2017

From our observation, we noticed that G.H.S Ngousso-Ngoulmekong is faced with same problem of limited machines as in other schools. Due to this reality, students of the examination classes (Terminal) are given additional periods to catch with "Informatique" (computer studies) practical lessons[147]. Access provides pedagogical material that can be used by students as well as teachers and also helps make it possible to initiate students to the computer not only as curriculum content but also as a medium for learning and for constructing knowledge[148].

[147] Mme Ogeune, Interviewed, G.H.S Ngousso-Ngoulmekong, 04 /05/ 2017.
[148] ROCARE-Cameroun, 2005

3.2. Available ICT tools and use within and without of the school premises

For the integration of ICT to be effective in Cameroon secondary schools, ICT tools must be available. As seen at the beginning of this chapter, ICT tools are devices and objects used in information and communications technology. Some of these tools are put in place to facilitate the teaching and learning of ICT in targeted population as shown in table 4b. This table clearly indicates some available ICT tools used in the three government secondary schools including Computers, Internet and Projectors. The analysis of this permited us to validate our research hypotheses one. Our research further reveals that internet connections is a problem in all the schools. This fact was observed during our interview with the Principal of G.H.S Nkolmesseng (Mvolo née Atangana T.) who talked of ineffective integration of ICT is her institution due to lack of internet connections. Also, Mme Onguene and Mme Ovono P. from G.H.S Ngousso-Ngoulmekong equally mentioned this lack which is a big handicap to ICT integration. The case of G.B.H.S Yaounde is different in that there is internet connection is their M.R.C though it is often instable but the availability of "Tutorial Software such as ENCARTER, help students to do their research in varied subjects"[149]. The absence and instability of internet connections in these schools explains why most student make use of it out of the school premises as seen in the subsequent table.

Table 4. Description of sample according to structures for regular internet visit

Structures for regular internet visit	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
School Computer Hall	31	20,7	8	16	21	21	60	20
At home	66	44	15	30	36	36	117	39
At the Cyber Café	33	22	15	30	21	21	69	23
Nil	20	13,3	12	24	22	22	54	18
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

The above table tells us that 39% and 23% of 300 respondents, stood for the idea that they regularly visit the internet out of the school premises (home and Cyber cafe). This gave us a high percentage of 62. In G.B.H.S Yaounde, where we have 66% (44% plus 22%) of 150 students, 60% (30% plus 30%) of 50 students from G.H.S Nkolmesseng and 57% (36% plus 21%) of 100 students from G.H.S Ngousso-Ngoulmekong. This therefore shows that most of the students regularly visit the internet out of their school premises thus confirming the absence

[149] Gang, F. D., Interviewed, G.B.H.S Yaounde, 10/05/2017

of internet connection in schools. On the other hand, just 20% responded that they often visit the internet in their School Computer Hall. Detail statistics shows that in G.B.H.S Yaounde 20.7% of 150 students, 16% of 50 students from G.H.S Nkolmesseng and 21% of 100 students from G.H.S Ngousso-Ngoulmekong who stood for the idea that they often visit the internet in their School Computer Hall. The disturbance of the internet connections in G.B.H.S Yaounde explains this low rate meanwhile the explanation from G.H.S Nkolmesseng and Ngousso is that shared personal internet connection gave some students advantage to visit the internet for practical lessons. That notwithstanding, 18% of the total sample size (300) did not give their opinion on this which can either be concluded that they are not interested, or they find it difficult to access and use the internet.

Although internet connection is a challenge to effective integration of ICT in our targeted population, students are still able to make several use of these ICT tools. From our observation, we discovered that they used them for educative purposes as well as for Leisure and communication as shown in the following table.

Table 5. Description of sample according to the different uses of ICT tools

Use of ICT tools	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Assignments and Research	105	70	23	46	62	62	190	63,3
Assignments	1	0,7	8	16	9	9	18	6
Leisure and Communication	23	15,3	2	4	13	13	38	12,7
Research	19	12,7	15	30	11	11	45	15
Nil	2	1,3	2	4	5	1,3	9	3
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

From the above table we observed that 63,3% of total sample, stood for the idea that they use ICT tools to do their assignments and research, 6% just to do their assignment, and 15% use only for their research. This gives us a total percentage rate of 84.3 thus signifying that the use of ICT tools has help students to do their assignments and research in other domains as well which can either be positive or negative. An insignificant percentage of 12.7 stood for the fact that they use ICT tools for leisure and communication while 3% adopted an indifferent attitude.

From the above, we can conclude that the use of ICT tools by students is highly felt at the level of their studies (assignments) and research which according to our interview with an ICT teacher Nenajou D. from G.B.H.S Yaounde, can yield positive or negative fruits. According to him, "some students use the internet to research on their homework while some use to download games, music, watch pornographic movies and so on"[150]. This negative aspect of ICT use was mentioned by almost all teachers interviewed. The use of internet out of the school premises by students, therefore reflects to what extent these students possess the skills of ICT and its applications and can apply them in everyday use.

3.2.1. Various ICT tools use by students

Living the 21st century era has exposed so many students to different ICT tools. This exposure and the integration of ICTs into Cameroon educational system has made easier for some students to access and use these tools. The domain of ICTs therefore comprises several tools including calculators, telephones, tablets, computers, printers, dictaphones, cameras, overhead projectors, interactive white boards, data storage tools and online learning platforms. During our research, we observed that some of these tools are used by both teachers and students thereby assisting them to learn ICT to develop skills**.** These students make use of different ICT tools in their schools and out of school premises.

In the case of G.B.H.S Yaounde, all the computer teachers asserted that students use computers, calculators, USB keys, and internet in their school to assimilate their lectures and generally to ease their studies[151]. Meanwhile in G.H.S Nkolmeseng and G.H.S Ngousso-Ngoulmekong, students mostly use computers and calculators. Out of school premises (At home and Cyber Café), most of these students confirmed their regular visit to the internet (See table 6) as we observe 66% of students from G.B.H.S Yaounde, 60% from G.H.S Nkolmeseng and 57% from G.H.S Ngousso-Ngoulmekong . Most of these students therefore confirmed their use of computer, data storage tools such as USB keys, telephones as well as calculators out of their schools. They have actually been in touch with the ICT tools for several years given the century in which we live and the decision of the Cameroon government to integrate ICT into her educational system. The longevity of students' use of ICT tools is thus seen in the following table 8.

[150] Nenajou D., Interviewed, G.B.H.S Yaounde, 25 /04/ 2017
[151] Computer teachers, Interviewed, G.B.H.S Yaounde, 10/05/2017

Table 6. Description of sample according to Longevity in using ICT tools

Longevity in using ICT tools	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
01-05 years	45	30	21	42	37	37	103	34,3
05-10 years	50	33,3	18	36	25	25	93	31
10-15 years	47	31,3	7	14	24	24	78	26
15+ years	5	3,3	1	2	11	11	17	5,7
Nil	3	2	3	6	3	3	9	3
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

The above table shows a high rate of longevity in students' use of ICT tools. Between 01 to 15 years, we observed that most of students in all the schools have been in touch with these tools. From 01 to 05 year, a total of 34,3% stood for the idea that they have been using ICT tools during this period while 31% stood for 05 to 10 years and 26% between 10 to 15years. All gives us a total of 91.3% of 300 students who responded that they have been using ICT between 01 to 15 years. On the other hand an insignificant 5.3% of students have been using for or more than 15years although 3% said nothing on this. This simply means that most of the students have been in touch with these tools thereby opening their minds. Bruner even made reference to the fact that using technology extends the power of the mind[152].

3.2.1. Various ICT tools use by teachers

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[153]. A 21st century teacher needs to be endowed with new skills in curriculum development and technology, lesson planning, class management, innovative teaching and evaluation strategies. Current teaching and learning strategies are being driven by electronic applications and processes. The process of teaching is incomplete without the use of pedagogic resources which have evolved with time from traditional media to advanced media thus stimulating students to learn with the use of educational technology. Today, we cannot talk of pedagogic resources without talking about ICT tools which includes; Calculators and telephones, computers and data storage tools, projectors, Dictaphones, LMS and MOOC. From our observation, we noticed that teachers of government secondary schools in Yaounde 5 (especially computer

[152] Bruner, 1966
[153] Pelgrum, 2001; Ndibalema, 2014

teachers) are using different ICT tools both in school and out of school to assist them to learn ICT, to develop skills and to prepare and deliver lectures. In the course of our interview, the H.O.Ds of Computer department in all the three targeted schools, states that they used so many ICT tools at home than in schools. During their lessons preparation at home, they often make use computers, mobile telephones, calculators, USB keys and internet at large meanwhile in school during lessons delivery, they at times make use of just laptops though projector, internet are sometimes used in G.B.H.S Yaounde. Printers are equally available for the printing of administrative and pedagogic documents[154]. The following table confirm some ICT tools used by teachers in the said schools.

Table 7. Description of sample according to some ICT tools use in schools

Some ICT tools use in schools	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Projector	13	8,7	4	8	2	2	19	6,3
Laptop	90	60	21	42	21	21	132	44
Mobil phone	10	6,7	9	18	18	18	37	12,3
Nil	37	24,7	16	32	59	59	112	37,3
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

From the table above, students confirm that Laptop is the ICT tool commonly used by teachers in all the three schools as 44% of 300 students stood for this idea. This is followed by 37,3% of student who were indifferent about this point. These students deny the idea that their teachers used ICT tools to teach. Meanwhile, 12,3% talked of the use of Mobil phone by teachers to teach and an insignificant 6,3% mentioned teachers' used of projector which is done on rare occasions. We also observed that contrary to the other schools, teachers of G.B.H.S Yaounde are trained by Monitors on how to fill marks in the computer. This explain why they always use computer to fill in their sequential marks. This motivated those teachers that were not interested in knowing how to use the computer. ICT integration is not just a matter of furnishing schools with computers without training teachers.

Conclusively, in all the three targeted schools, we have computer halls as well as available ICT tools and their uses within and without the school premises. These ICT tools as observed are used for practical ICT lessons, research, assignments, communication and leisure.

[154] HODs, interviewed, government secondary schools yaounde V, 2017

Most importantly is the presence of a M.R.C available only is G.B.H.S Yaounde where ICT integration is highly felt AS Compared to other schools (G.H.S Nkolmesseng and G.H.S Ngousso- Ngoulmekong). Here, we have seen that information and communication technology is integrated the said schools through necessary ICT tools put in place. This thus validate our first Hypothesis (H1) which says ICTs is implemented in Government Secondary schools in Yaounde V through necessary elements put in place to facilitate the integration of this innovation.

CHAPTER FOUR

OUTCOME OF INTEGRATING ICT IN GOVERNMENT SECONDARY SCHOOLS IN YAOUNDE FIVE (V)

The importance of ICT has been recognized by the Government of Cameroon given that her Ministry of Education set out in the 2007-2015 Program, ICTs learning objectives with national ICT policy in basic education[155]. Empirical evidence from school Principals, Vice-principals, teachers, and students highlight how meaningful the integration of ICT into teaching and learning processes provides opportunities for learners to broaden their horizons, develop critical thinking skills, represent themselves, and share with others. Therese Mungah Shalo Tchombe in her paper argues that ICT in education, especially in African contexts, can improve the quality of education by supporting new pedagogical approaches in which the teacher is more of a "guide on the side" than a "sage on the stage." As she puts it elsewhere, the study showed "some shift from textbook-based schooling to web-supported community of inquiry. … Before, knowledge resources available in content-thin textbooks and limited libraries could not sustain inquiry-oriented pedagogy"[156]. Despite the advantages realised from integrating ICT in government secondary schools of Yaounde Five (V) municipality, some negative impacts were equally observed as analysed in this chapter.

4.1. Positive effects of integrating ICT into the school curriculum

The implementation of ICT in education was fully embraced by the Cameroon government due to its benefits in an educational system. This was actually observed in the field as well as some threats. Prerequisites for using ICT in transformative ways in educational settings include teachers who are confident and competent enough to guide technology use and students with sufficient knowledge base and cognitive skills. That notwithstanding, ICT integration in government secondary schools of Yaounde Five (V) municipality, has brought some benefits at the levels of students, teachers and the institution.

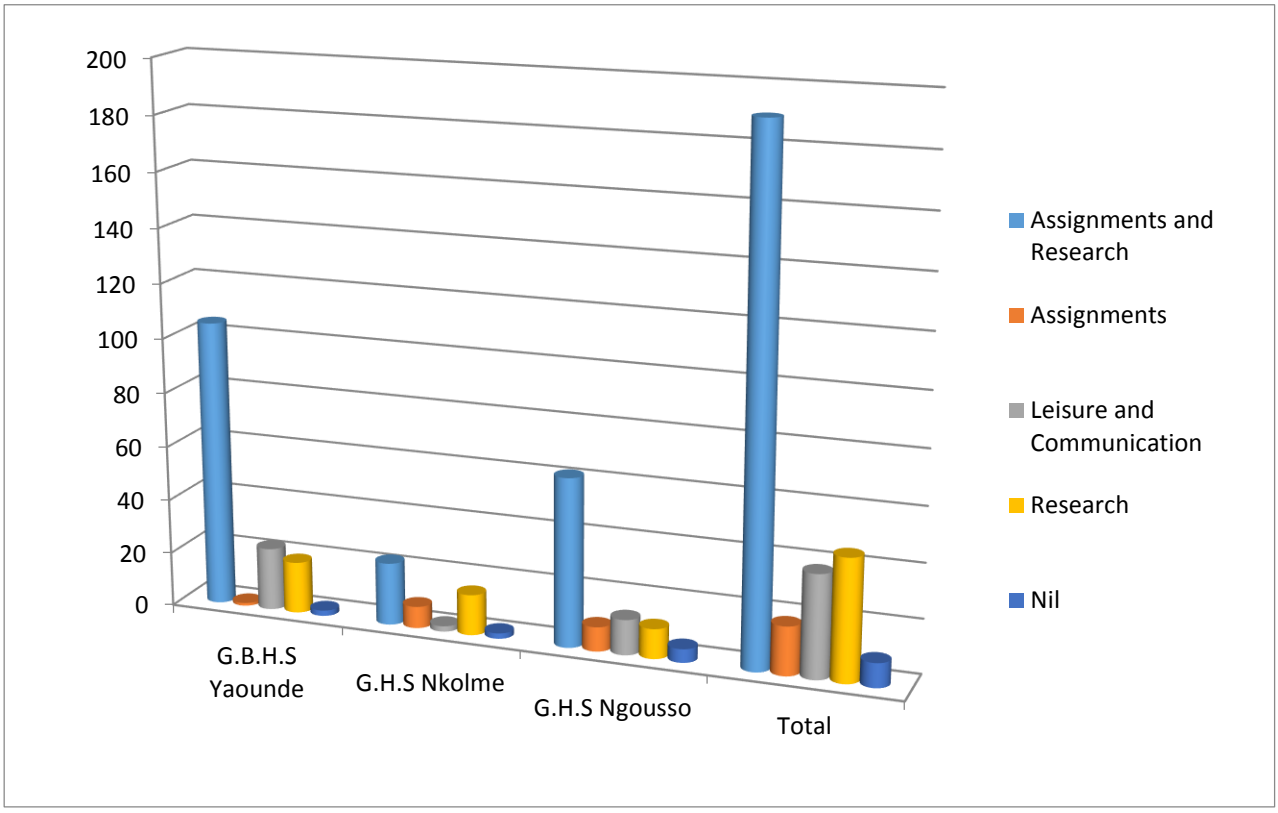
4.1.1. Benefits at the level of students

The integration of ICT has been helpful to the students of government secondary schools in Yaounde IV. From our research findings we discovered that ICT serves as a pedagogical tool

[155] Mbangwana, 2008
[156] Tchombe, 2006: 42 (Therese Mungah Shalo Tchombe)

for researching information and constructing knowledge. A teacher from G.B.H.S Yaounde confirmed that "Students obtain information from the internet where they lack textbooks." "Now our students can no longer avoid doing homework with the excuse that they do not have the required textbooks. There is easy access by both students and teachers to relevant information"[157]. Also in focus group discussions with students in G.B.H.S Yaounde, a 17-year-old Joseph in upper sixth stated that "Thanks to the study of ICT, we can now carry out research using the internet to get more material for our assignments and complete our lessons since the teacher cannot give everything". The idea was also shared by other schools as seen in Figure 5 below (See analysis of table 7). Teachers in all three schools indicated that ICT is useful to students because it enables them to obtain information, do research, learn and understand better, and communicate.

Figure 6. Description of sample according to the different uses of ICT tools



Source: : Author, from field investigation, May 2017

[157] Mme Enyang R. Interviewed, G.B.H.S Yaounde, 23/05/2017

From the above bar chart, our sample is described according to the different uses of ICT tools. This brings out the benefits or importance realised by students as a result of their study of ICT. See the analysis of table 7 which clearly explain the above Figure 5. The importance of ICT is as well observed in the following table 10.

Table 8. Description of sample according to Benefits of ICT

Benefits of ICT	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Know how to use the internet	42	28	7	14	25	25	74	24,7
Do research on my assignments	37	24,7	19	38	37	37	93	31
Know different computer programs	64	42,7	22	44	30	30	116	38,7
Has not helped me	4	2,7	1	2	4	4	9	3
Nil	3	2	1	2	4	4	8	2,7
Total	150	100	50	100	100	100	300	100

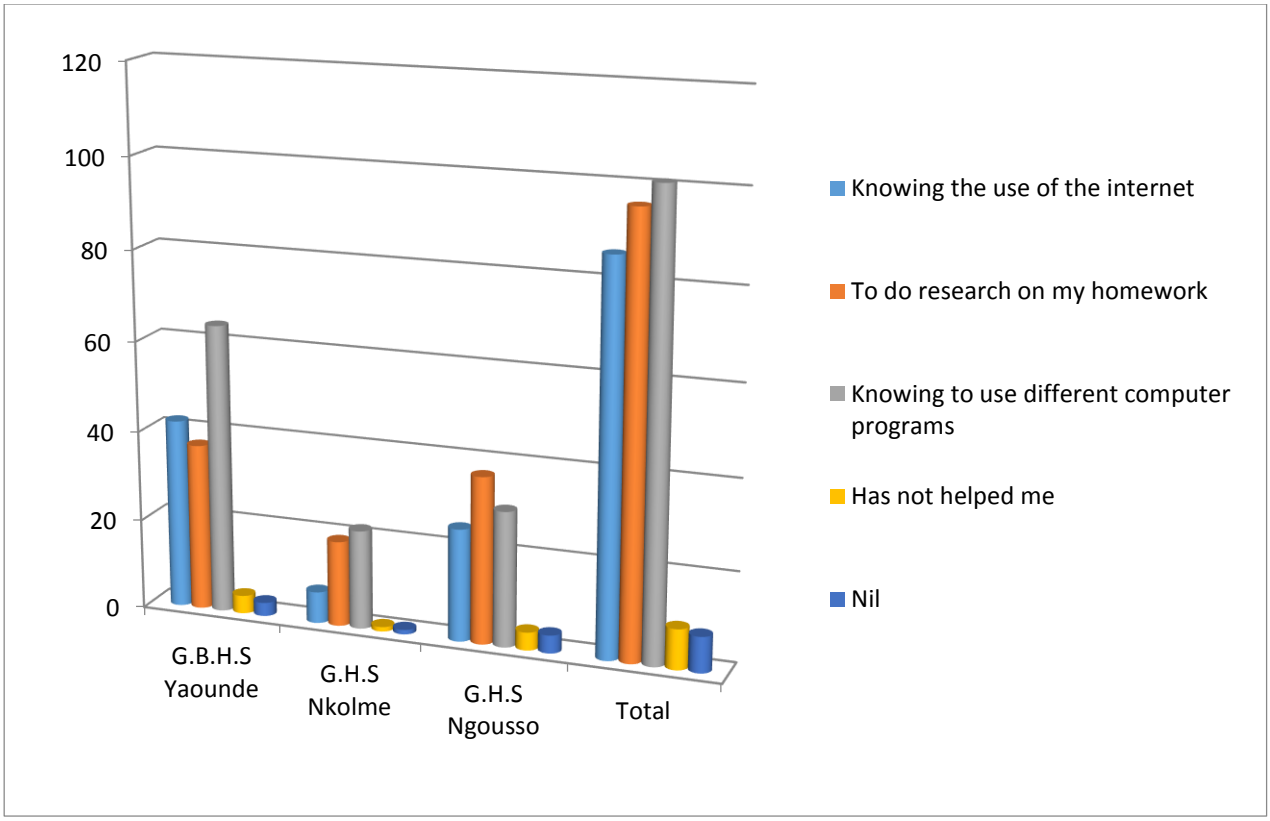
Source: The students, from field investigation, May 2017

From the above table we observed that 38,7% of total sample, stood for the idea that ICT has help them to know different computer programs, 31% said it helped them to research on their assignments, and 24,7% know how to use the internet thanks to their study of ICT. Meanwhile an insignificant 3% said ICT has not help them in any way while 2,7% did not express their opinion on this. A higher percentage of students from G.B.H.S Yaounde (42,7%) and G.H.S Nkolmesseng (44%) know different computer programs thanks to the integration of ICT into their school curriculum contrary to G.H.S Ngousso whose high percentages (37%) testify that ICT has help them to be able to research on their assignments. This is supported by the availability of application software programs observed in these schools. We have application software such as Word, Excel, Access, PowerPoint, under Microsoft office package and C, C++, Pascal, Turbo Pascal which are under programing languages package. "Here in Lycée Bilingue, we have some Tutorial Software such ENCARTER, Claroline, that enable students and teachers to do research even in the absent of internet connections"[158]. We equally observed BUM (Bon usage médicament), crash, Photoshop, Bream River Tutorial Software. These Tutorial Software were all available in G.B.H.S Yaounde contrary to the other two schools where we had just few of them. Despite the insufficiency in term of lack of internet and

[158] Ngoupayou L. Z, Interviewed, G.B.H.S Yaounde, 17/05/2017

limited Tutorial Software as compare to G.B.H.S Yaounde, students of G.H.S Nkolmesseng and G.H.S Ngousso still benefit greatly from the integration of ICT as seen in table 10 above. This can as well be represented in a Bar chart below.

Figure 7. Description of sample according to Benefits of ICT



Source: Author, from field investigation, May 2017

Rapid technological change can produce sudden increase in expectations, which in turn can dramatically affect motivation**.** The integration of ICT has had a motivating effect on students as evident in comments from the principal of and Vice principals of the three schools studied. For instance, the vice principal in charge of computer department of G.H.S Nkolmesseng said "les élevés sont toujours content et exciter pendent les cours pratique d'informatique"[159]. He explained how happy and excited students behave during the ICT lessons as they always fight to get into the computer hall during this period. Some high school science students stressed the positive effect on them since science textbooks are very expensive and consequently few students can afford them so, they largely depend on the internet for material. The influx in computer halls and M.R.C during the hours of ICT practical lessons and other hours made computer teachers to note that ICT has a motivating effect on students.

[159]Mballa S., Interviewed, G.H.S Nkolmesseng, 03/04/2017

Moreover, the computer teacher/monitor from G.H.S Ngousso-Ngoulmekong affirmed that "les technologies favorisent énormément l'intérêt des élevés pour l'école. Les exemples portent sur l'attitude des enfants qui ne veulent pas laisser les machines respirer. Ils sont très attentifs"[160]. A Monitor from G.B.H.S Yaounde stated: "De maniere affirmative, les TIC favorisent l'intérêt des élevés pour l'école. Les élevés vont au centre multimédia enrichir les connaissances, préparer leur exposes, télécharger des exercices éducative"[161]. On the whole, the teachers observed that ICT excites the students and generates more interest in school. This high motivation, collaboration, attention and participation is much evident among the Form five (5), and high school students for whom computer studies is an examination discipline. Additional evidence of motivation is the reduced rate of absenteeism and increased school participation given that the use of computers and internet increase students' involvement in learning.

Generally speaking, the integration of ICT has instigated positive attitudes in must students because we observed that students' attitudes regarding the use of ICT were positive. They are more conscious of the fact that they are 21st century learners and that our rapidly changing world demands a good mastery of ICT in order for them to be able to best situate themselves in the job market.

Students' perceptions of competencies is another benefits that comes with the integration of ICT. From our observation, we noticed that some students are so intelligent that they have mastered how to use and operate the different computer programs. This explain why some of the Peer support was evident in the extent to which peers helped solve problems of their classmates who ran into technical difficulties. Some students were already identified as experts who teach others how to connect to the computer and operate it. One of the expert student was able to identify and fix the laptop of the researcher when it got freeze. This ICT do not only build in students the skill of a researcher but also make them able to easily collaborate and communicate as observed. This is thus represented in the following table 9b.

[160] Mme Ogeune, Interviewed, G.H.S Ngousso-Ngoulmekong, 04 /05/ 2017
[161] Fosso, Interviewed, G.B.H.S Yaounde, 28/04/2017

Table 9.a. Description of sample according to opinion on ICT Benefits

ICT is beneficial to me	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
yes	149	99,3	50	100	99	99	298	99,3
No	1	0,7	0	0	1	1	2	0,7
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

Table 9.b. Rating computer knowledge to collaborate, communicate, research assignments.

Rating Beneficial computer knowledge	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Good	119	79,3	36	72	72	72	227	75,7
Moderate	30	20	12	24	24	24	66	22
Poor	1	0,7	2	4	4	4	7	2,3
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

From the above tables we observed that a total number of 298 out of 300 students accept that ICT is beneficial to them thereby giving us a percentage rate of 99,3% . On the other hand, 2 students refused this fact, giving us an insignificant rate of 0.7% (See Table 11.a.). Further seeking students' assessment of their computer knowledge to collaborate, communicate, do assignments and research, we got a total percentage rate of 75,7% who rate their knowledge as good (applying to all the schools), while 22% rate moderate contrary to an insignificant 2,3% who have a poor computer knowledge to collaborate, communicate, do assignments and research. From this, we can therefore draw a conclusion that, thanks to the integration of ICT students are trained the competent skills of the 21st century learners given that they are able to collaborate, communicate, do their assignments and research. This thus validate our secondary hypotheses two (**H2**) which states that: **The integration of ICT is necessary so as to trained students with the competent skills of the 21st century learners.** Computer technologies therefore enable learners to acquire problem-solving "21st Century skills" and competencies that go beyond traditional school knowledge[162]. Such skills situate learners in a better position in today's knowledge economy the moment they graduate from secondary school. These tables (11.a. and 11.b.) therefore enable us to come up with a contingency table from which a chi-

[162] Kozma, 2005

square value was calculated so as to see if this actually validate our H2 (See table11c and 11d. below)

Table 9.c. Contingency Table for Hypothesis Two (H2): The integration of ICT is necessary so as to trained students with the competent skills of the 21st century learners

H2	Good	Moderate	Poor	Total
YES	227	64	7	298
NO	0	2	0	2
Total	227	66	7	300

Source: The students, from field investigation, May 2017

This table shows the description of sample according to opinion on the different types of ICT tools used. In order to calculate the Chi square (X^2) values, the Expected frequencies are required. The formula for Expected frequency (E) is: $E = \frac{tr \times tc}{N}$

Where tr = Total frequency of rows, tc = Total frequency of columns, and N = Total number of observations (sample size).

Table 9.d. Calculation of Chi square (X^2) value for Hypothesis Two (H2)

Observed (O)	Expected (E)	O-E	$(O-E)^2$	$(O-E)^2/E$
227	225,4867	1,513333	2,290178	0,0101566
64	65,56	-1,56	2,4336	0,037120195
7	6,953333	0,046667	0,002178	0,000313199
0	1,513333	-1,51333	2,290178	1,513333333
2	0,44	1,56	2,4336	5,530909091
0	0,046667	-0,04667	0,002178	0,046666667
Chi Square (= sum of $(O-E)^2/E$)				7,138499085

Source: Author, from field investigation, May 2017

The Chi Square formula is given by: $X^2 = \Sigma \frac{(O-E)^2}{E}$

Where O = Observed frequency, E = Expected frequency, and Σ = Sum of.

From table 11.d above, we noticed that the X^2 calculated is equal to 7,14. To read the critical value, it is necessary to calculate the degree of freedom (df) using the formula: (df) =

(r-1) (c-1). Where (r) = Number of rows, (c) = Number of columns. Therefore our (df) = (c - 1) (r - 1) = 2(1) = 2

Therefore the X^2 critical value at 0.05 level of significance, with 2 (df) is 5.991.

To draw our conclusion, we must verify what the decision rule says.

Decision Rule:

i) If the X^2 calculated is greater than X^2 critical value (X^2 cal. > X^2 crit.), reject the null hypothesis (Ho).

ii) If the X^2 critical value is greater than X^2 calculated (X^2 crit. > X^2 cal.), retain the null hypothesis (Ho).

Back to our analysis above, we observed that the X^2 calculated (X^2 cal.) 7,14. is greater than the X^2 critical value (X^2 crit.) 5.991. That is, (X^2 cal. > X^2 crit.). We therefore reject the null hypotheses (Ho) thus validating our Hypotheses two (H2) we assert that: **The integration of ICT is necessary so as to trained students with the competent skills of the 21st century learners**

4.1.2. Benefits at the level of teachers

The integration of |ICT in government secondary schools under Yaounde V municipality has not only benefited students but teachers as well. Some teachers who were interviewed confirmed that ICT has helped them in diverse ways as it enables them to do research, calculate marks, and prepare lessons. We observed in G.B.H.S Yaounde that all the teachers have access to the M.R.C. One of the monitors (Djeugang A) states: "We assist both students and teachers on proper use of the computer where necessary. Unlike students, teachers are free to use these machines any time that the hall is free. They each own a password through which they type and save their sequential marks"[163]. Teachers in this school are therefore able to do their research, prepare their lessons and even use the available ICT tools (Computer and projector) to teach. By this, they gradually train themselves with the skills of 21st century teachers.

Teachers also benefit from training on basic computer skills organised by the Cameroon delegation of secondary education although not all teachers often show interest. This as noted by one of the teachers who attend, stirred his interest in ICTs and also motivates her into personally improving her knowledge in ICT. Which as she confirmed, has "opened me to other cultures, further studies and improved my teaching-learning activity"[164]. Monitors of this school

[163] Djeugang A., Interviewed, G.B.H.S Yaounde, 10/05/2017
[164] Mme Enyang R., Interviewed, G.B.H.S Yaounde, 23/05/2017

said that the school M.R.C has websites rich in all types of information and on various disciplines which can provide teachers with access to a broad array of teaching and learning resources. There are cases where these computer lab monitors download information for teachers who make such requests. ICT has therefore helped these teachers to access teaching and learning material for their classroom use and to calculate marks. The Head of the Computer Unit in G.B.H.S Yaounde said, "Science and math teachers make profuse use of the multimedia centre to search for information"[165].

Beyeme Beyeme (Senior Discipline Master) from G.H.S Nkolmesseng equally comment that ICT has positive effect especially on young teachers who make sure all their pedagogic documents are typed. "They are able to deepen their knowledge through research so as to better prepare their lesson although some of them complain of how costly it takes them to visit the internet without owning a personal computer"(Beyeme Beyeme G. G.H.S Nkolmesseng, Interviewed, 08/05/2017).

One of the Vice Principal from G.H.S Ngousso-Ngoulmekong also expresses this fact that although some teachers do not own a computer, our rapidly changing technological world has prompted teachers to learn how to use a computer, do research so as to better their lesson and comfortably fit in the society[166]. The school computer teacher and a monitor (Mme Ogeune) equally mentioned that the integration of ICT has come to make teaching easier. Teachers are now supposed to act as a facilitator, helping students to actively engage in constructing their own knowledge. This will obviously make effective the new pedagogical teaching/learning approach which is "student centered"[167]. We can therefore say that ICT is a supporting teaching method since it "change the role of the teacher from a disseminator of information to a learning facilitator, helping students as they actively engage with information and materials to construct their own understanding"[168]. It can as well make it possible for teachers to engage students in constructivist learning experiences. Such practical approach to teaching and learning have the potential to positively affect the quality of education.

Although some teachers do not own computers and have limited skills, the integration of ICT have given them good ideas about what they can do with a computer. Nearly all the teachers interviewed perceived the use of informatics in support of the organization of their teaching. They talked about preparing their classes with the help of the computer. Fadimatou

[165]Awono, Interviewed, G.B.H.S Yaounde, 10/05/2017
[166] Mme Ovono P., Interviewed, G.H.S Ngousso-Ngoulmekong, 04 /05/ 2017
[167] Blurton 2000, p. 49
[168]Ibid

H. from G.H.S Nkolmesseng said that with an Internet connection, she could search for online content to support her teaching. These teachers said they could use the computer as a layout tool and the H.O.D Philosophy department from G.B.H.S Yaounde talked about the possibility of setting examination using the computer and easy communication with colleagues and administration thanks to his good mastering of these ICT tools. "ICT Provide greater opportunity for teacher-to-teacher and student-to student communication and collaboration[169]. Elombwe K. from G.H.S Ngousso-Ngoulmekong acknowledged the potential of ICTs as a way of overcoming the lack of educational resources. : "For children who don't have textbook, I can write exercises and print them"[170].

Interestingly, no teacher showed any negative feelings about ICT. A little fear, quickly broken after the first manipulations, but no more. On the contrary, teachers perceive the Internet as a possibility of development, as a step to be taken as affirmed by Fadimatou: "ICT is making us a part of the technological global village. You can only make the integration to the world through technologies. It makes learning and teaching easier and more modern"[171].

For the teacher, ICT is a means of connecting Cameroon with the rest of the world and being part of the global village created by ICT. She (Fadimatou) believes that her school has a role to play in the spread of ICT use in Cameroon and that to do so, the computer room must be used by teachers. We find a similar discourse among teachers from other schools. ICTs are seen as a way for Cameroon to develop. Tiemtoré, in a study carried out among the actors of the educational milieu in Burkina Faso, finds in the speech of administrators and teachers the same hope for ICT in education: "they consider ICT as a panacea, "Savior" a little in the religious sense of the term, which will bring the solution to the many difficulties they encounter on a daily basis "[172].

Our findings therefore highlight that ICT helps teachers move learners to produce their own knowledge since it can provides them with access to a variety of examples of teaching practices, and the opportunity to engage in reflection and analysis, both individually and in groups. Pedagogically, it also ensures that lessons are didactic, punctuated with questions, explanations, reactions and problem solving. Such an approach addresses the social constructivist theory in learning that focuses on peer tutoring, collaborative learning and cooperation. As Haddad explains, these technologies make it possible for teachers and learners

[169] Siwiyni C., Interviewed, G.B.H.S Yaounde, 10/05/2017
[170] Elombwe K., Interviewed, G.H.S Ngousso-Ngoulmekong, 04/05/ 2017
[171] Fadimatou H., Interviewed, G.H.S Nkolmesseng, 09/05/2017
[172] Tiemtoré, 2007, p.6

to master educational materials by "going over the same material in a variety of forms and media, layering in additional information and nuances of understanding while re-enforcing the learning objectives"[173]. This is a practical situation noticed during our semi-interview with teachers of all the three schools as they testify that ICT provide borderless global access to information for them as well as learners. Internet connectivity makes it possible for educational resources, such as lesson plans, books articles and other resources to be exchanged with relative ease[174].

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.

A need for better ICT training for teachers is therefore important to avoid an old curriculum being used to strengthen poor pedagogical processes that will not respond favourably to provide quality education. A teacher may have the best computer, the most sophisticated curriculum software, and the fastest internet connection, but if that teacher does not know how to use any of that, it is not going to improve the teaching/learning process. A better trained ICT teacher will thus help students to learn to navigate through great amounts of information, to analyse and make decisions.

4.1.3. Benefits at the level of School administration

The school principals who in this context are considered as technological leaders see the integration of ICT into their school curriculum as opening up new horizons and providing new pedagogical opportunities for their students and teachers. They explained how ICT has improved school administration and said how internet could help overcome lack of services like a well-stocked library. Given that thanks to the internet, access to range of services including libraries and careers' services, can be brought together in one place. This can support and stimulate learning and teaching across the curriculum and at all levels. As ICT becomes

[173] Haddad, p.25, 1998
[174] Kozma, 2005

part of the everyday life of the schools, there is a need to ensure the participation in the learning opportunities provided. According to school principals, the use of ICT in schools is 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, these principals agreed on the fact that the teaching and learning environment is characterised by two key players (teachers and students). According to them, for students to have an education in a secondary school, they need stakeholders to guide and support in order to facilitate 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.

From our observational studies we realised that the integration of ICT has made it possible for the schools to have their archives kept in both hard and soft copies. In each of the school secretariat visited, we discovered that they have their school archives kept in both computers and external hard devices which can only be accessed by the Principals or with his authority. The Principals talked of more secured and save administrative documents that can always be consulted when necessary thanks to ICT. Also important to note here is the save and secured computerised students report cards which are available in both hard and soft copies and the authenticity can always be verified where need arises. To this the Principal of G.B.H.S Yaounde said: "The school administration had created a student report card system where teachers are obliged to create an intra-school account to submit students' assessment information"[175]. He therefore highlighted that these programme put in place is another way of enhancing the use of ICT in the school as he further 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"*[176].

The Principals of all the three schools made mentioned of the fact that even though their staffs are not well trained in ICT in their schools, the Secondary Education ministry organised ICT seminars in the domain of using ICT as a device in delivering their lessons and teachers are encouraged to attend. In G.H.S. Ngousso-Ngoulmekong, one of the Vice Principal mentioned

[175] The Principal, Interviewed, G.B.H.S Yaounde, May 2017
[176] Ibid

that many teachers are not even interested in the in-service ICT training organise once in a while.

The integration of ICT has made the school benefits from new pedagogical infrastructures such as the computer halls in all the schools and M.R.C found only in G.B.H.S Yaounde. The principals affirmed of using their personal initiative to personally encouraging parents through the Parents Teachers Association (P.T.A), to invest in the school ICT infrastructure. To this one of the principal asserts that: "The Parents Teachers Association (PTA) has through my advice put in a lot of money in the use of ICT in this school"[177]. It was therefore clear in the course of our interview with the Principal of G.B.H.S Yaounde that, ICT is a tool that can change the teaching and the learning process. According to the principals in question, ICT is a veritable tool for academics given that it has been a facilitating engine for teachers to get information which can be impacted to the students. This is confirmed by the Principal of G.H.S Ngousso-Ngoulmekong who said: "ICT is a veritable pedagogic 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"[178]. There is therefore the need for teachers to incorporate ICT in their teaching since ICT is a tool that can transform the country.

It was evident throughout the analysis and observation that the utmost desire of the school administrators 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. This is seen through seminars put in place by the schools and the delegation in charge of secondary education. The principal from G.B.H.S Yaounde 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, "although all my teaching staff can boast of basic knowledge on how to manipulate the computer because they have single responsibility to fill in their sequential marks at the school M.R.C"[179]. Principals were all conscious of shared leadership style as they mentioned the need for ICT to provide training for other teachers.

The principals talked about the positive ICT environment set up in the school where other teachers apart from ICT staffs are encouraged to have their lessons in the school computer

[177] Op.cit
[178] The Principal, Interviewed, G.H.S Ngousso-Ngoulmekong, 04 /05/ 2017
[179] The Principal, Interviewed, G.B.H.S Yaounde, May 2017

classrooms/multi-media centre such that they work together towards using ICT as the main pedagogic tool in the schools. To this, the vice principal in charge of the computer department from G.B.H.S Yaounde said: "Non–ICT staff are encouraged to use the school M.R.C. for their lessons. Here, they have access to ICT tools such as computer and projector for practical demonstration of real life situations to ease understanding and make lessons more interesting"[180].

Broadly speaking, schools recognize that with ICT system, effectiveness in teaching and learning can be improve and costs reduce. The Integration ICT in our targeted schools has therefore had positive impact on education as seen in better performance of students and the learning of entirely new skills needed for a developing economy. We also have the development of teachers' technology skills, knowledge of new pedagogic approaches as well as improved attitudes toward teaching. And finally, there are other outcomes such as increased innovativeness in schools. ICTs therefore make curriculum implementation learner-centred with a self-learning environment that enables the student customize his/her own learning experiences. With ICT on administration and overall workload, once teachers have the technicalities, they can enhance their teaching and create additional teaching resources. Use of ICT for assessment purposes can also release valuable teacher time. Within schools, those specific technological developments will regard to the personalization of the learning experience.

4.2. Negative effects of integrating ICT into the school curriculum

The integration of ICT in the educational domain is explain by our today's interconnected world in which information and communication technology is widely used. ICT gives great impact in education for both learners and teachers and the entire society at large. It has become a key driver in education given its positive impact on students' skills and teachers' competencies as seen previously. Empirical evidence from our targeted population highlight how meaningful the integration of ICT into teaching and learning processes provides opportunities for both teachers and learners to broaden their horizons and develop critical thinking skills. On the other hand we equally have evidence of negative impacts of information and communication technology. However, this negative impacts considered many conditions which can be categorized at student related, teacher related, and at the level of school administration related. All of these potentially limit the benefits of ICT to education.

[180]Manga,T., Interviewed, G.B.H.S Yaounde, 10/05/2017

4.2.1. At the level of students.

The integration of ICT has had some negative effects on students of government secondary schools under Yaounde 5 municipality. From our observation, most of these students who are well abreast with the basic computer skills, feel lazy to attend the class as they rely so much on information or material that they easily gets through the internet. During the focus group discussion, some "Terminal S" students made us to understand that whenever the computer hall is open, they prefer to spend more time there to the extent of not attending some lessons. Reasons that they can easily get the studied material through the internet. This obviously changed their behaviour to become irresponsible students. The technological reliability was important and yet the students could respond negatively to a resource, both of teaching and technology.

Across the schools, we noticed that some students prefer their teachers to lecture, give them notes to copy so that they can easily read after and during school time rather than giving them assignment to often to do research on certain topics. They students prefer visiting a website for their personal research rather than being sent by their teachers. These students explain that since they already master the use of different computer programs (See Table 12), it is easier for them to search information and after flipping through them they "cut and paste", print out and submit to their teachers. Some students complained that they are often left with the option of "cutting and pasting" materials for teachers to read because they at times find it difficult to read, understand and select good material. Copying and pasting quantities of information rather than learning to take notes correctly and reference work thus leading to an ease of plagiarism. Here, we see less value accorded to ICT that spent too much time on presentation needs and copying without reading and understanding. Apart from the challenges faced with using the internet for assignment, they very well master different computer programs that permits them to entertain themselves (Download of music (done mostly by female students) and films (done mostly by male students), game play (done mostly by Form 1, 2 and 3 students), chatting with friends through Facebook, Yahoo messenger and email). Through this type of behaviour, reliability of the students are affected.

Table 10. Description of sample according to the impacts of ICT

Impacts of ICT	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Know how to use the internet	42	28	7	14	25	25	74	24,7

Research to do assignments	37	24,7	19	38	37	37	93	31
Know different computer programs	64	42,7	22	44	30	30	116	38,7
Has not helped me	4	2,7	1	2	4	4	9	3
Nil	3	2	1	2	4	4	8	2,7
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

From the above table, we see that the integration of ICT in the three targeted schools has had some impacts on the students. 38,7% of 300 students stood for the opinion that it is thanks to their study of ICT that they know different computer programs. Despite the fact that this opinion carries the highest percentage in two schools (G.B.H.S Yaounde with 42,7% of 150 students, G.H.S Nkolmesseng 44 % of 50 students), G.H.S Ngousso had 30% of 100 students meanwhile a total of 37% standing for the opinion that ICT has helped them to be able to research and do their assignments, same opinion holds for G.H.S Nkolmesseng with 38%, and G.H.S Ngousso with 37% but in G.B.H.S Yaounde we had 24,7% giving us total percentage of 31%. This is followed 24,7% of the total sample who said the integration of ICT in their school has helped them know how to use the internet given that we have 28% of this response from G.B.H.S Yaounde, 14% from G.H.S Nkolmesseng, and 25% from G.H.S Ngousso. Although we have an insignificant total of 3% for those who said their study of ICT has not help them in any way not leaving out a total 2,7% of those adopted an indifferent attitude in responding to this preoccupation.

The above results simple mean that the study of ICT has greatly affected these students more especially in knowledge of the different computer programs as well as to research to do assignments. This explains why teachers confirmed that students are always excited as they fight their way all the time into the computer halls/M.R.C. Some even prefer keeping away from classes to work on computers whenever they have the least opportunity. We observed that all those who know the different computer programs as well as research to do assignments, know how to use the internet. They use it positively as seen previously and at times negatively in that they access the internet for other things instead of educative reasons. They for instance visit Facebook, MSN, Yahoo, Twitter and others for communication and leisure. Some visit unauthorised sites for pornographic images and videos. Which according to Pappas (2013), watching "sexually explicit media", has increased people's exposure to sexual content by 0.3 to 4.0 percent of behaviour changes. All these negatively affects and changes the behaviour of

students because they want to act what they watch and see on the internet thus drifting them from the purpose of ICT for education.

Furthermore, the study of ICT has caused some health effects as some students complained of problem such as stress and eyes strain due to their sitting in front of the computer for a long time. This can obviously affect students in their education. The time spent in front of the computer both in school and at home pushed some students into unauthorised sites. More especially those students who master the different computer programs. This was confirmed by some teachers, computer monitors and students. Pornography sites are the unauthorised sites visited by the students which may provoked some illegal act of pornography in their school milieu. Those students who are affected by this suffer at times in their studies as they will waste time by using ICT rather than to study on their work. Somehow, they will become more rebellious when influenced by such negative material. Today, we even see so many students using mobile phones for communication and leisure and paying less interest to their studies.

An inappropriate use of computer and the internet by students have significant negative effects on their attitude and achievement as they tend to misuse the technology for leisure time activities and have less time to learn and study. Although this is viewed negatively, these students look at it from a positive point of view given that through the use of computers and internet, they are exposed to different cultures and more information regarding their studies as well as societal issues (See Table 13). This therefore explains the results got in the table below where the highest percentage of students stood for the idea that ICT integration into their school program has brought some changes especially in the socio-cultural and educational domains.

Table 11.a. Description of sample according to opinion on changes brought by the integration of ICT

ICT integration has brought changes	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Yes	132	88	47	94	78	78	257	85,7
No	18	12	3	6	22	22	43	14,3
Total	150	100	50	100	100	100	300	100

Table 11.b. Description of sample according to opinion on changes brought by the integration of ICT

Opinion on socio-cultural & educational changes from ICT	G.B.H.S Yaounde	%	G.H.S Nkolmesseng	%	G.H.S Ngousso	%	Total	%
Good	137	91,3	44	88	81	81	262	87,3
Moderate	12	8	5	10	18	18	35	11,7
Poor	1	0,7	1	2	1	1	3	1
Total	150	100	50	100	100	100	300	100

Source: The students, from field investigation, May 2017

From the above table 13.a, 85,7% of a total of 300 students accepted the view that the integration of ICT has brought some changes contrary to an insignificant 14,3%. Further in table 13.b, which rate the opinion of these students precisely on the socio-cultural and educational changes from ICT, a great number of them (262) stood for good, giving us 87,3%. Meanwhile just 11,7% rate their opinion as moderate and an insignificant 1% as poor. From this results, we no doubt conclude that, although the inappropriate use of computer and internet is considered negative from our observation, these students look at this positively given that it exposed them to different cultures and more information regarding their studies as well as societal issues. This according to them, render them more independent in all domains of life and more responsible. From the above results, our third hypothesis (H3) which state that: **The integration of ICT has brought about Social, Cultural and Educational changes** is validated.

The above tables (13.a. and 13.b.) therefore enable us to come up with a contingency table from which a chi-square value was calculated so as to see if this actually validate our H3 (See table13c and 13d. below)

Table 11.c. Contingency Table for Hypothesis Three (H3): The integration of ICT has brought about Social, Cultural and Educational changes

H3	**Good**	**Moderate**	**Poor**	**Total**
YES	232	23	2	**257**
NO	30	12	1	**43**
Total	**262**	**35**	**3**	**300**

Source: The students, from field investigation, May 2017

This table shows the description of sample according to opinion on changes brought by the integration of ICT. In order to calculate the Chi square (X^2) values, the Expected frequencies are required. The formula for Expected frequency (E) is: $E = \frac{tr \times tc}{N}$

Where tr = Total frequency of rows, tc = Total frequency of columns, and N = Total number of observations (sample size).

Table 11.d. Calculation of Chi square (X^2) value for Hypothesis Three (H3)

Observed (O)	**Expected (E)**	**O-E**	**$(O-E)^2$**	**$(O-E)^2/E$**
232	224,4467	7,553333	57,05284	**0,254193325**
23	29,98333	-6,98333	48,76694	**1,626468408**
2	2,57	-0,57	0,3249	**0,126420233**
30	37,55333	-7,55333	57,05284	**1,519248476**
12	5,016667	6,983333	48,76694	**9,720985604**
1	0,43	0,57	0,3249	**0,755581395**
Chi Square (= sum of $(O-E)^2/E$)				**14,00289744**

Source: Author, from field investigation, May 2017

The Chi Square formula is given by: $X^2 = \Sigma \frac{(O-E)^2}{E}$

Where O = Observed frequency, E = Expected frequency, and Σ = Sum of.

From table 13.d above, we noticed that the X^2 calculated is equal to 14,00.

To read the critical value, it is necessary to calculate the degree of freedom (df) using the formula: (df) = (r-1) (c-1). Where (r) = Number of rows, (c) = Number of columns. Therefore our (df) = (c - 1) (r - 1) = 2(1) = 2

Therefore the X^2 critical value at 0.05 level of significance, with 2 (df) is 5.991.

To draw our conclusion, we must verify what the decision rule says.

Decision Rule:

i) If the X^2 calculated is greater than X^2 critical value (X^2 cal. > X^2 crit.), reject the null hypothesis (Ho).

ii) If the X^2 critical value is greater than X^2 calculated (X^2 crit. > X^2 cal.), retain the null hypothesis (Ho).

Back to our analysis above, we observed that the X^2 calculated (X^2 cal.) 14,00. is greater than the X^2 critical value (X^2 crit.) 5.991. That is, (X^2 cal. > X^2 crit.). We therefore reject the

null hypotheses (Ho) thus validating our Hypotheses three (H3) we assert that: **The integration of ICT has brought about Social, Cultural and Educational changes**

There is no doubt that the impact of availability of ICT on student learning strongly depends on its specific uses. If information and communication technology is not properly used, the disadvantage will overweight the advantage. For example, while students use the internet, it may confuse them by the multiplicity of information to choose from. As a result, the teacher spends some time to control students from websites unrelated to the learning content. We therefore observed that the use of ICT has affected students' behaviour negatively in different ways. Their frequent use of computers can limit their imaginations and equally over-reliance on ICT can limits their critical thinking and analytical skills as well. The fact that they often have only a superficial understanding of the information they download, distraction from their learning and attraction to unwanted sites are problems that negatively affects these students.

4.2.2. At the level of teachers

Teachers' attitude plays an important role in the teaching-learning process that uses computers and internet connections. Although teachers' attitude towards use of these technologies is vital, our observation reveal that teachers do not have clarity about how far technology can be beneficial for the facilitation and enhancement of learning. Of course, some teachers may have positive attitudes to the technology, but refrain from using it in teaching due to low self-efficacy, tendency to consider themselves not qualified to teach with technology. In this respect, Bandura describes self-efficacy as "individual's opinion of capabilities to organize and perform courses of actions to achieve particular types of performances"[181]. Moreover, as identified by Brosnan, attitude, motivation, computer anxiety, and computer self-efficacy are factors affecting teachers' use of computers in their lessons. Many teachers may not have the required IT skills and feel uncomfortable, nor do they have trainings needed to use the technology in their teaching. Unless teachers develop some basic skills and willingness to experiment with students, ICT use in education is in a disadvantage[182]. In the case of our targeted population, although teachers have a positive view about ICT integration in Cameroon secondary schools, we observed some teacher related negative effects from this integration.

There were cases of Science teachers who depends a lot on the use ICT tools to ease their teaching and learning activities. Most often, these teachers are faced with the problem of not checking through the details of the work searched from the web. Some teachers mostly

[181] Bandura, 1986
[182] Brosnan, 2001

depend on the information that searched from the internet which is liable to mistakes and still needs to be selected. Teacher who always show the example of the work from the internet and copy the information, will not show a good example for the students. That may cause the students to copy their teachers'' action and start to copy and paste just as they do. It is important to note here that information and knowledge which come from the internet are not necessary correct, reasons why teachers have to be more careful when doing research from the internet.

Another difficulty faced by teachers due to ICT integration, is that most of their students do not do assignments that require them to use the internet because they often get themselves attracted to communication and leisure activities and end up not doing their assignments thereby slowing down teachers' work. In the course of interviewing teachers, we were made to understand that this is very common with the form three, five and lower sixth students and that they are often inattentive in class. Even those who have free access to internet at home are not exempted. Students' environment and resources at both home and school therefore have a big part to play in their attitude and use of ICT in learning.

Teachers are faced with the problem of fully applying the new competent based teaching-learning approach due to time allocated per subject. Limited teaching hours is a challenge that comes with the integration of ICT. According to some teachers, teaching assisted with ICTs is ideal but time consuming in getting the necessary facilities. It is also challenging in dealing with the technology related limitations of ICT use in education such as virus attack of software and the computer, interruptions of internet connections, and poor supply of electric power. This discourage teachers and demotivate some of them who had developed small interest in using ICTs thus making it difficult for them to engage in innovative classroom practices.

From our observation, it is evident that those teachers who often use ICT in their teaching-learning activities are focusing on the internet search and word processing. Cuban firmly affirms that technically, the use of new technology amends the way teachers usually carry out their teaching activities[183]. Majority of the teachers who were considered ICT competent used computers for grade recording, administrative purposes, communication, and personal projects which in effect renders these teachers ineffective and inefficient in their teaching profession. Although some ICT tools and resources were made available to the targeted schools which is a valuable resource for the learning and teaching process, very few teachers as observed made use of these ICT tools in their teaching and learning process.

[183] Cuban, 2001

Following the interview with the vice Principals and teachers, they asserted that ICT in education is still a new concept and so it will take time for teachers to effectively make 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. One of the vice Principal from G.H.S Ngousso-Ngoulmekong, responded 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 of board and"[184]. The 19th century teaching and learning methodology which was therefore teacher-centered, affected teachers' thinking in this 21st - century (ICT era). The reason being that 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 problems impede teachers' confidence from the benefits of its practical use[185].

From a general point of view, the pedagogic use of ICT in these schools can be considered as very low. Maturity of teachers were passive users and 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 a major problem faced by teachers. This problem can be traced from teacher training programs which have a significant impact on teacher use of ICT in teaching. Agyei and Voogt 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[186]. 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.

[184] Mme Ovono P., Interviewed, G.H.S Ngousso-Ngoulmekong, 04 /05/ 2017
[185] Cuban, 2001
[186] Agyei and Voogt, 2012

4.2.3. At the level of School administration.

The integration of ICT in government secondary schools in Yaounde V municipality also realised some negative effects at the level of School administration. Here, computer is not enough for teachers to make the best use of ICT in the classroom. Based on the research of Sandhoitz, it will take a lot of time in the classroom even up to a year with the support of experienced teams. That notwithstanding, the principals admitted that they had little to contribute to influencing the use of these tools in the schools. Reasons being that most of the decisions about the curricula planning and scheme of work are drawn by the Ministry of Secondary Education. And that they were all faced with difficulties when it comes to providing ICT tools and resources due to limited finance. This according to one of the Principals could be solve by the Ministry of Secondary Education so as to enhance the use of ICT in the school. She said:" I think one of the ways to encourage the utilisation of these tools in our schools is for Ministry of Secondary Education to ensure that a school has sufficient ICT tools and ICT technicians because the problem we face here is that we need technicians to maintain the ICT tools"[187].

The integration of ICT has also had infrastructural challenges weighing on the school administration. The Principals of the schools visited, expressed their worry for limited ICT infrastructure and tools. Some had to seek help from parents through the school P.T.A as one them said that it is not an easy task to bring parents to an understanding that they have to go extra miles for their children to effectively study ICT. Even the absent of a M.R.C and internet connections in two of schools (G.H.S. Nkolmesseng and G.H.S Ngousso-Ngoulmekong) and lack of the different types of ICT tools are added challenges that the school administration has to deal with alongside other educational challenges. With respect to these impeding factors of ICTs integration the school administration has to strategize alongside the ministry of secondary education which is not always easy.

Moreover, the high cost of maintaining the available ICT tools especially computers and projectors is another difficulty that the school administration has to deal with. Despite the fact that more classrooms are needed with ICT equipped tools, we observed that some computers were bad and needed repairs and replacement and so "managing three or four students per computer is not obvious"[188]. One of the monitors from G.B.H.S Yaounde said "the available technician we have comes once or twice in a year which is not sufficient for proper

[187] The Principal, Interviewed, G.H.S Nkolmesseng, 03/04/2017).

[188] Fadimatou H., Interviewed, G.H.S. Nkolmesseng, 09/05/2017

maintenance of the machines"[189]. Djeugang further explain how some malicious students exchange bad computer Mouse they bring from their homes with good ones from the school computer hall. "At times they even destroy the key board and Mouse when fighting to work on a machine"[190]. As a result the school administration do well to keep these tools intact and strictly control how they are used. This strict control is also seen at the level of giving out projectors to teachers in G.B.H.S Yaounde. A Geography teacher (Zacharie F.) explained how discouraging it is to use the school projector given legal complex process to fulfil[191]. This school monitor advanced reasons for this as he said: "I think this legal procedure is due to the expensive and delicate nature of the projector"[192]. The school administration is therefore oblige to handle incurred cost from the introduction of ICT which is very challenging given that it slow down the school programme. This is observed with late entering of sequential marks by teachers at the M.R.C, at times the late printing of examination question paper, and some urgent administrative documents.

Difficulties in accessing projectors and computers that teachers at time encountered with the school administration have raised several issues that make teaching with ICTs difficult. As a result, school administrators have to follow-up teachers through different means to get them motivated in using ICTs in the teaching and learning process which is not always evident. Reason being that very few teachers received pre-service training in using ICTs for teaching purposes. Most of the teachers interviewed lack competence and enthusiasm to use computers in the instructional processes. 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.

In brief, using ICT in transformative ways in educational settings include teachers who are confident and competent enough to guide technology use and students with sufficient knowledge base and cognitive skills. Its integration in government secondary schools of Yaounde V has some impacts on students, teachers and the school administration. The observed reality in these schools is that thanks to this integration students are train with the competent skills of the 21st century learners and also it has brought about Socio-cultural and Educational changes. This thus validate our second and third Hypothesis (H2 and H3)

[189] Djeugang A., Interviewed, G.B.H.S Yaounde, 10/05/2017
[190] Ibid
[191] Fosso, Z., Interviewed, G.B.H.S Yaounde, 10/05/2017
[192] Djeugang A., Interviewed, G.B.H.S Yaounde, 10/05/2017

CONCLUSION

In all, this study has established that the integration of ICT in government secondary schools in Yaounde five (V) has had some changes in the teaching and learning process. This affirmation comes after analysing the extent to which ICT integration in the said government secondary schools has brought about behavioural change in the teaching-learning activity. In the course of this, we were opportune to analyse how information and communication technology is implemented in the Government Secondary schools, why this ICT integration is necessary and the impacts of implementing ICT in Government Secondary schools in Yaounde V. A detail insight of our mother or targeted population was thus necessary before this analysis.

It is therefore worth noting that all the three Government Secondary Schools has different creation and evolution history. G.B.H.S Yaounde being the oldest and largest in terms of everything, gradually grow after its creation from one level to another. This is explained by the fact that other series including ICT studies were implemented into the school curriculum. Meanwhile G. H. S Ngousso-Ngoulmekong follows and gradually grow from one level to another as well. And finally, we have G.H.S Nkolmesseng which is the youngest of all the three schools given that it has been existing just for three year (2014 to 2017). The integration of ICT in these three schools has generally help to familiarise both students and teachers with the use and workings of computers. This has actually brought changes in diverse ways most especially in the socio-cultural and educational domains. ICT in education therefore promotes change to education in 21st century as it transforms teaching and learning processes. This gets to increase learning gains for students providing them with opportunity to develop creativity, communication skills, and other thinking skills. ICT in education makes possible a learning environment in which students, teachers and administrators can easily communicate and collaborate with each other, share secure information around the clock and ultimately, access a world of knowledge beyond classroom walls.

Integrating ICT in these schools is made easier with the available computer classrooms, M.R.C and other ICT tools. These tools as observed are used for practical ICT lessons, research, assignments, communication and leisure. Comparatively, ICT integration is more effective in G.B.H.S Yaounde than in other schools (G.H.S Nkolmesseng and G.H.S Ngousso-Ngoulmekong). This is because it is the only schools having both computers halls and a M.R.C. The available ICT tools and internet connections is an added advantage to this school which is not experienced in the other schools because they have just equipped computer classrooms. That notwithstanding, ICT has led to a gradual transformative teaching and learning process.

This change which is observed in diverse ways affects students, teachers and the school administrators as well. According to Watson "IT is not only perceived as a catalyst for change, but also change in teaching style, change in learning approaches, and change in access to information"[193]. Using ICT in transformative ways in educational settings include teachers who are confident and competent enough to guide technology use and students with sufficient knowledge base and cognitive skills. From our observation, we noticed that an ICT-rich educational experience brings benefits to the students, teachers and administrators.

However, empirical evidence from school Principals, Vice-principals, teachers, and students highlight how meaningful the integration of ICT into teaching and learning processes provides opportunities for learners to broaden their horizons, develop critical thinking skills, represent themselves, and share with others. ICT gives great impact in education for both learners and teachers and the entire society at large. It has become a key driver in education given its positive impact on students' skills and teachers' competencies. On the other hand even though the integration of ICT is meaningful into teaching and learning processes we equally have evidence of negative impacts given the challenges that comes with this integration. Our result thus affirm that ICT integration in Government Secondary schools under Yaounde V municipality has brought about behavioural change in the teaching-learning activity at the student, teacher and administrative related levels.

[193] Watson, 2001: 251

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APPENDICES

Appendix 1.

Questionnaire For Participative Diagnoses

Dear Respondent, I am a Master student in the Department of Science of Education, University of Yaounde I. I am currently carrying out a research on Integration of Information and Communication Technology (ICT) in Cameroon government Secondary schools of Yaounde five (V) Council and behavioural change in teaching-learning activity. Kindly assist me with the following information. **Your answers will help enhance the success of this research work**. This Questionnaire is designed for an academic purpose only. Please, be objective and sincere. Your timely response will be appreciated.

Thanks for your assistance

Please tick (√) besides the choice(s) that best describes you and fill the blank spaces where necessary.

A- IDENTIFICATION

Q1. Your sex

☐ Male ☐ Female

Q2. Your age range

☐ 10– 14 ☐ 15 – 20 ☐ 21 +

Q3. Your educational level

☐ First Cycle (precise your class)**……...** ☐ Second Cycle (precise your class)**……**

Q4. Which subjects are you specialised in?

☐ Arts Subjects ☐ Science Subjects

B- QUESTIONS BASED ON HYPOTHESIS AND VARIABLES

<u>Access to ICT tools</u>

Q1. Do you make use of ICT tools in your school?

☐ Yes ☐ No

Q2. What are the different ICT tools you use in school?

☐ ☐

Computer and Internet Telephone and USB key ☐ All

Q3. How often do you use these tools in school?

☐ One time per week ☐ Two times per week ☐ Three times per week ☐ Daily

Q4. Where do you often make use of these tools in school?

☐ Classroom ☐ Computer Hall ☐ School Library

Q5. Do you often visit the internet to research on particular topics?

☐ Yes ☐ No

If yes where do you do that?

☐ School Computer Hall ☐ At home ☐ At the Cyber Cafe

Q6. How often do you visit the School Computer Hall?

☐ One time per week ☐ Two times per week ☐ Three times per week ☐ Daily

Importance of ICT

Q7. Do you think ICT is beneficial to you?

☐ Yes ☐ No

If yes, how?

☐ Helps to better understand my lessons ☐ Ease communication with others

☐ Better trains me for the world's job market ☐ All

Q8. What do you often use these ICT tools for?

☐ Assignments and Research ☐ Assignments

☐ Leisure and Communication ☐ Research

Q9. Do you have an email address?

☐ Yes ☐ No

If yes, how often do visit your email box?

☐ Weekly (precise number of times) …….. ☐ Monthly (precise number of times) ……

☐ Daily (precise number of times) …….. ☐ Yearly (precise number of times) ……

Q10. For how long have you been using ICT tools?

☐ 01- 05years ☐ 05 - 10years ☐ 10 - 15years ☐ 15+

Q11. In what way has the use of ICT during this period helped you?

☐ It has help me know how to use the internet ☐ It helped me to do research on my lessons

☐ I now know how to use different computer programs ☐ It has not helped me in any way

Outcome or Impact of using ICT

Q12. Do you regularly attend ICT classes?

☐ Yes ☐ No

If No why?

☐ Because I do not like the subject. ☐ Because I find it difficult to understand

Q13. Why did you decides to study ICT?

☐ It will help me to easily have a job ☐ I was asked to do it

☐ It will make me a good researcher ☐ I want to meet up with today's ICT world

Q14. Does your study of ICT makes it easier for you to do assignments and research in other subjects?

☐ Yes ☐ No

If No, why?

☐ Because I am more comfortable using textbooks to do assignments

☐ Because I do not have access to computer and internet as I want.

☐ Because I find it difficult to use the computer and internet

Q15. How has the use of ICT affected your studies?

☐ Positively ☐ Negatively ☐ No change

Q16. Do your teachers at times use ICT tools in classroom to teach you?

☐ Yes ☐ No

If yes, what do they use?

☐ Projector ☐ Laptop ☐ Mobil phone

Q17. Do your teachers at times ask you to do you assignments using the internet?

☐ Yes ☐ No

Appendix 2.

INTERVIEW GUIDE

Dear Respondent, I am a Master student in the Department of Science of Education, University of Yaounde 1. I am currently carrying out a research on Integration of ICT in Cameroon government Secondary schools of Yaounde five (v) and behavioural change in teaching-learning activity. Please kindly assist me with the following information.

This interview guide is purely for an academic purpose. Please, be objective and sincere. Confidentiality will be given the highest respect.

Thanks for your assistance.

I- INDENTIFICATION

Name: …….....

Institution: ..……

Occupation:..……..

Contact: ….……..

II- COMPUTER TEACHERS

1-Longevity in Service

2-Opinion on access of ICT and ICT facilities to Students and teachers

3-General class and official examination performance rate

4-Exiciting and difficult computer programs to students

5-Importance of ICT studies to both teachers and students

6-The various impacts that results from the integration of ICT into the school Curriculum

7-Persistent difficulties encountered in teaching the subjects

8-Opinion on non-computer teachers' use of the school Multimedia centre or Computer hall

III- MULTIMEDIA STAFFS AND MONITORS

1-Longevity in service as a multimedia staff / monitor

2-Opinion on access of ICT and ICT facilities to both teachers and students

3-Number of Computers at the service of both teachers and students

4-Opinon on maintaining the computers in good state

5-Importance of ICT studies to both teachers and students

6-The various impacts that results from the integration of ICT into the school Curriculum

7-Difficulties encountered with the machines, teachers and students

IV- SOME ADMINISTRATIVE STAFFS (VICE PRINCIPALS)

1-Longevity in service

2-Opinion on access of ICT and ICT facilities to Students and teachers

3-Importance of ICT studies to both teachers and students

4-The various impacts that results from the integration of ICT into the school Curriculum

5-Difficulties faced with integrating ICT into the school Curriculum

6-Opinion on students' use of ICT tools in School

V- NON-COMPUTER TEACHERS

1-Longevity in teaching

2-Opinion on access of ICT and ICT facilities to Students and teachers

3-Opinon on the use of ICT tools to facilitate teaching

4-Importance of ICT studies to both teachers and students

5-The various impacts that results from the integration of ICT into the school Curriculum

6-Difficulties encountered in using ICT tools as facilitators in the teaching-learning activities

7-Opinion on the school Multimedia or computer hall

Appendix 3.

Standard Chi Square Table with P-Values indicated on row 1 and degree of freedom indicated on Column 1

df	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1	---	---	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

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