

UNIVERSITY OF EDUCATION, WINNEBA

INFLUENCE OF PEDAGOGICAL SUPPORT FOR ICT IN TEACHING AND
LEARNING OF ICT IN BASIC SCHOOLS IN GHANA: THE MEDIATING ROLE
OF TEACHERS' AND STUDENTS' ICT SELF-EFFICACY

CAIPHAS KWAME KENNEY

DOCTOR OF PHILOSOPHY

2022

UNIVERSITY OF EDUCATION, WINNEBA

INFLUENCE OF PEDAGOGICAL SUPPORT FOR ICT IN TEACHING AND
LEARNING OF ICT IN BASIC SCHOOLS IN GHANA: THE MEDIATING ROLE
OF TEACHERS' AND STUDENTS' ICT SELF-EFFICACY

CAIPHAS KWAME KENNEY

9181770001

**A thesis in the Department of Educational Leadership, Faculty of Education and
Communication Sciences, submitted to the School of Graduate Studies in partial
fulfilment of the requirements for the award of the degree of Doctor of
Philosophy
(Educational Leadership – Curriculum Development Option) in the University of
Education, Winneba**

MARCH, 2022

DECLARATION

STUDENT'S DECLARATION

I, CAIPHAS KWAME KENNEY, declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE:

DATE:

SUPERVISORS' DECLARATION

We hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

Professor Frederick Kwaku Sarfo (Principal Supervisor)

Signature.....

Date.....

Dr. Stephen Baafi-Frimpong (Co-Supervisor)

Signature.....

Date.....

DEDICATION

This work is in honour of my father Joshua Narh Kofi and to my mother Dora Korkor, my wife Josephine Adu-Osei and my children.

ACKNOWLEDGEMENTS

I am grateful to my principal supervisor, Professor Frederick Kwaku Sarfo, Vice-Chancellor of Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development (AAMUSTED) for his time, positive criticisms and encouragement in making this work a success. I am also grateful to my co-supervisor, Dr. Stephen Baafi-Frimpong, Senior Lecturer, Department of Education and Psychology, University of Cape Coast for his time, positive criticisms, and encouragement in making this work a success.

My appreciation also goes to Mr. K. I. Adentwi, Senior Lecturer and Head of Department of Interdisciplinary Studies, AAMUSTED – Kumasi Campus, who advised me to pursue this programme and has encouraged me from the beginning to the completion of the programme.

I am also appreciative to Mr. Lawrence Hornuvo, lecturer at KNUST School of Business, Mr. Francis Arthur, University of Cape Coast, and Mr. Kwame Anane, a teacher of English at Prempeh College for their various roles and support.

My final gratitude goes to my family especially, my wife Josephine Adu-Osei, my mother, Dora Korkor and all my siblings for their constant support and encouragement. I am truly grateful to you all.

TABLE OF CONTENTS

CONTENT	PAGE
TITLE PAGE	
DECLARATION	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xiv
LIST OF FIGURES	xvi
ABSTRACT	xvii
CHAPTER ONE: INTRODUCTION	1
1.1 Background of the Study	1
1.2 Situation of ICT Teaching and Learning in Basic Schools in Ghana	8
1.3 Statement of the Problem	9
1.4 Purpose and Objectives of the Study	15
1.4.1 Purpose of the Study	15
1.5 Research Questions and Hypotheses	16
1.6 Justification/Significance of the Study	18
1.7 Delimitation of the Study	19
1.8 Definition of Terms	20
1.9 Organisation of the Thesis	22
CHAPTER TWO: EDUCATION IN GHANA, REFORMS AND THE ICT CURRICULUM	25
2.1 The Country Ghana	25
2.1.1 Socioeconomic Development of Ghana	26

2.2 Educational System and Structure in Ghana	26
2.2.1 Educational System and Structure in Pre-Colonial Ghana	27
2.2.2 Pre-University Structure of Formal Education System in Independence and Post-Independence Ghana	28
2.2.3 Basic Education or School	31
2.3 Advent Of Formal Education in Ghana and the Castle Schools	32
2.4 Contemporary Developments in Ghana’s Education System	35
2.4.1 The Ghana Education Service	35
2.5 Educational Reforms in Ghana after Independence	37
2.5.1 The Kwabong Committee Educational Review/Reform 1967	40
2.5.2 The Dzobo Committee Educational Review/Reform 1973	41
2.5.3 The Anfom Committee Educational Review/Reform 1987	42
2.5.4 Anamoah-Mensah Educational Review/Reform 2007	44
2.6 The ICT Curriculum in Basic and High Schools in Ghana	45
2.6.1 Rationale and aims of the Basic School ICT Curriculum	46
CHAPTER THREE: REVIEW OF PEDAGOGICAL SUPPORT FOR ICT AND SELF-EFFICACY OF ICT USE	48
3.1 Conceptual Review	48
3.1.1 Meaning of Pedagogical Support for ICT Teaching and Learning	48
3.1.2 ICT Infrastructure	49
3.1.2.1 Conceptualisation of School ICT Infrastructural Needs	52
3.1.3 ICT Training	54
3.1.3.1 Conceptualisation of ICT Training Avenues	59
3.1.4 Teaching and Learning Resources and Facilities	60
3.1.5 Incentive/Motivation	62

3.1.5.1 Intrinsic Motivation	64
3.1.5.2 Extrinsic Motivation	67
3.1.6 Exploring the Concepts of Teaching and Learning and their Relationship	69
3.1.6.1 The Concept of Teaching	69
3.1.6.2 The Concept of Learning	72
3.1.6.3 Teaching and Learning Relationship	73
3.1.7 Self-Efficacy	74
3.1.8 Development of Construct Measurement Scale	77
3.1.9 Overview of the Pedagogical Support for ICT (PSICT) and ICT Teaching and Learning (ICTTL) Measurement Scales	81
3.2 Empirical Review	84
3.2.1 Studies Related to Pedagogical Support for ICT Teaching and Learning and Self-Efficacy of ICT use in School	84
3.2.1.1 Studies involving ICT Integration in School or Education	85
3.2.1.2 Studies involving challenges undermining Teaching and Learning of the ICT Curriculum/Subject	91
3.2.1.3 Studies Involving Effectiveness of ICT Teaching and Learning	94
3.2.1.4 Studies Involving Teachers and Students' Self-Efficacy of Icts Use in School	97
3.2.2 Conclusions Drawn from the Empirical Studies Reviewed	103
3.3 Theoretical Framework and Review of Theories	105
3.3.1 Theoretical Framework (Social Support Theory)	105
3.3.2 Learning Theory	107
3.3.2.1 Behaviourism Learning Theory	107
3.3.2.2 Cognitive Learning Theory (CLT)	110

3.3.2.3 Constructivism Learning Theory	111
3.3.3 Motivation Theory	112
3.3.3.1 Goal-Setting Theory	113
3.3.3.2 Expectancy Theory of Motivation	113
3.5 Conceptual Framework Underpinning the Study	115
3.6 Novelty and Strength of the Study	117
3.7 Summary of Literature	118
CHAPTER FOUR: RESEARCH METHODOLOGY	123
4.1 Methodology	123
4.2 Research Approach and Philosophical Underpinning	123
4.3 Research Design	128
4.4 Population, Sample and Sampling Techniques	130
4.4.1 Population of The Study	130
4.4.2 Sample of The Study	131
4.4.3 Sampling Techniques	132
4.5 Instrumentation for Quantitative Study /Design	134
4.5.1 Pedagogical Support for ICT (PSICT)	135
4.5.2 ICT Teaching and Learning (ICTTL)	135
4.5.3 Adapted CSE Scale By Teo & Koh (2010)	135
4.5.4 Initial Validation and Pilot Test of Questionnaire Instrument	136
4.5.5 Validation of Questionnaire Data through EFA, CFA, GOFIS and Correlation Analysis	137
4.6 Instrumentation for Qualitative Study	140
4.6.1 Interviews	140
4.6.2 Focus Group Discussion	141

4.6.3 Observation	142
4.7 Procedure for Data Collection	144
4.7.1 Questionnaire Administration	144
4.7.2 Interview with Teachers and Students	147
4.7.3 Focus Group Discussions with Teachers and Students	148
4.7.4 Observation Study in the Schools	149
4.8 Reliability and Validity of Data	149
4.8.1 Reliability of Quantitative Data	150
4.8.2 Validity of Quantitative Data	150
4.8.3 Credibility of Qualitative Data	150
4.9 Data Analysis	151
4.9.1 Analysis of Quantitative Data	151
4.9.2 Analysis of Qualitative Data	152
4.10 Ethical Issues	153
4.10.1 Informed Consent	154
4.10.2 Confidentiality and Anonymity	154
4.11 Limitations of the Study	155
CHAPTER FIVE: DATA ANALYSIS, PRESENTATION AND DISCUSSION	
OF RESULTS	157
5.1 Respondents Characteristics or Profile	157
5.2 Reliability and Validity Test	160
5.2.1 Exploratory Factor Analysis (EFA) of Scale Measures	160
5.2.2 Confirmatory Factor Analysis (CFA)	164
5.2.3 Goodness of Fit Indices (Gofis)	169
5.2.4 Correlation Analysis	170

5.3 Dimensions of Pedagogical Support for ICT (PSICT)	171
5.4 Answering the Research Questions and Testing the Research Hypotheses of the Study	174
5.4.1 Pedagogical Support for ICT Teaching and Learning	175
5.12.1 Need For Pedagogical Support for ICT and its availability in Basic Schools	181
5.4.2 Teaching and Learning of ICT in Basic Schools in Ghana	185
5.13.1 Opinions on the Effectiveness of the ICT Programme in Basic Schools	188
5.4.3 Self-Efficacy of ICT Use	192
5.14.1 Teachers' And Students' Perception of their Self-Efficacy of ICT Use	194
5.4.4 Test of Research Hypotheses using Structural Equation Modelling Results from AMOS	196
5.4.4.1 Estimates of the Path Models through Structural Equation Modelling	198
5.10 Discussion of Results	203
5.10.1 Availability of Pedagogical Support for Teaching and Learning of the ICT Programme in Basic Schools	203
5.10.2 Effectiveness of Teaching and Learning ICT in Basic Schools	208
5.10.3 Teachers' and Students' Self-Efficacy of ICT Use in the Basic School	211
5.10.4 Influence of Pedagogical Support for ICT on Teaching and Learning ICT in the Basic School	214
5.10.5 Influence of Pedagogical Support for ICT on Self-Efficacy of ICT use in the Basic School	216
5.10.6 Influence of Teachers' and Students' ICT Self-Efficacy on Teaching and Learning of ICT in the Basic School	233

5.10.7 The Mediation Role of Self-Efficacy of ICT use in the influence of Pedagogical Support for ICT and Teaching and Learning ICT	217
5.10.7 Availability of Pedagogical Support for ICT in Primary and Junior High Schools	218
5.10.8 Relating the Results of the Study to the Theoretical Framework	218
CHAPTER SIX: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS	220
6.1 Summary of the Study	221
6.1.1 Key Findings of the Study	237
6.1.1.1 Availability of Pedagogical Support for Teaching and Learning of ICT In the Basic School	222
6.1.1.2 Effectiveness of ICT Teaching and Learning in Basic Schools in Ghana	222
6.1.1.3 Teachers' and Students' Perception of their Self-Efficacy of ICT Use	223
6.1.1.4 Influence of PSICT on Teaching and Learning of ICT	223
6.1.1.5 Influence of PSICT on Teachers' and Students' Self-Efficacy of ICT Use	223
6.1.1.6 Influence of Self-Efficacy of ICT Use on Teaching and Learning of ICT	223
6.1.1.8 Difference in Pedagogical Support in Primary and Junior High School	224
6.2 Conclusions	224
6.3 Implications of the Study	226
6.4 Recommendations	228
6.5 Contributions of the Study	230
6.6 Recommended Areas of Further Research	231
REFERENCES	232
Appendix A: Study Regions and District/Municipal/Metropolitan Assemblies	270

Appendix B: Survey Questionnaire for the Study	271
Appendix C: Interview Guide for Basic School ICT Teachers and Students	279
Appendix D: Focus Group Discussion Topics/Questions	284
Appendix E: Observation Study Checklist	285
Appendix F: Application Letter to Request Introduction Letter from Department	286
Appendix G: Introduction Letter from Department of Educational Leadership	287
Appendix H: Sample Application Letter to District/Municipal/Metropolitan Directors of Education for Access to Schools to Collect Data	288
Appendix I: Sample of Permission Letter from District/Municipal/Metropolitan Directors of Education to Collect Data	289
Appendix J: Sample List of District Schools by Categorization into Urban, Semi-Urban and Rural	290
Appendix K: Informed Consent form for Teacher Interviewees	291

LIST OF TABLES

TABLE	PAGE
4.1 Cronbach's Alpha Reliability Results of Pilot Test	137
4.2: Schedule of Personal Administration of Questionnaires to Schools	147
5.1 Background Information of Respondents	159
5.2 Exploratory Factor Analysis (EFA) of Measures of Pedagogical Support for ICT (PSICT)	161
5.3 Exploratory Factor Analysis (EFA) of Measures of ICT Teaching and Learning	163
5.4 Exploratory Factor Analysis (EFA) Loading of Measures of Self-Efficacy of ICT Use	164
5.5 Reliability and Validity of Pedagogical Support for ICT Construct Dimensions through Confirmatory Factor Analysis (CFA)	167
5.6 Reliability and Validity of ICT Teaching and Learning Construct through Confirmatory Factor Analysis (CFA)	167
5.7 Reliability and Validity of the Self-Efficacy of ICT Use Construct through Confirmatory Factor Analysis (CFA)	168
5.8 Summary of Cronbach's Alpha Reliability of Scale Constructs of Main Data	168
5.9 Goodness of Fit Indices (GoFIs) of Constructs/Variables	169
5.10 Correlation Analysis between the dependent and independent variables of the study	171
5.11 Structural Equation Modeling (SEM) of Dimensions of PSICT to the Overall PSICT Construct.	172
5.12 Availability of Pedagogical Support for ICT Teaching and Learning in Basic Schools in Ghana	175

5.13 Effectiveness of Teaching and Learning of ICT in the Ghanaian Basic Schools	186
5.14 Basic School Teachers and Students Perception about their Self-efficacy of ICT Use	192
5.15: Results of the Path Models through Structural Equation Modelling	198
5.16: Mediation Results of the Structural Model	200
5.17 Descriptive Statistics for Dimensions of ICT Support	200
5.18 MANOVA Results of Differences in Infrastructure, ICT training, Facility, Resources, and Incentive based on School Category	201
5.19: Tests of Between-Subjects Effects	202

LIST OF FIGURES

FIGURE	PAGE
2.1: Graphical Representation of Ghana's current Formal Educational System and Structure	30
3.1: Conceptualisation of School ICT Infrastructure Areas	53
3.2: Conceptualisation of source of receiving ICT training	60
3.3: Conceptualisation of source of incentive/motivation for ICT teaching and learning	68
3.4: Basic Model of Expectancy Theory	114
3.5: Conceptual Framework Underpinning the Study	116

ABSTRACT

The Government of Ghana introduced educational reforms in 2007 that added ICT as a teaching subject at the pre-tertiary level. This study assessed the influence of pedagogical support for ICT (PSICT) in teaching and learning of ICT (TLICT) in basic schools in Ghana and the mediating role of teachers' and students' ICT self-efficacy (TSICTSE). The sequential explanatory mixed method research design was employed. The sample size for the quantitative study and qualitative study was 600 teachers and students, and 20 teachers and students respectively. Multi-staged sampling was used to select the sample from ten districts in ten regions. The quantitative data was collected using a survey questionnaire. Interviews, focus group discussion, and observation were used to collect the qualitative data. Descriptive statistics, regression and MANOVA analysis were employed to analyse the quantitative data. The qualitative data was analysed thematically. The results showed that generally, appropriate PSICT is lacking. Moreover, the results revealed that the TLICT was effective. Again, the results indicated that teachers and students were self-efficacious in basic ICT skills. The results further showed that PSICT positively and significantly influence TLICT and also influence TSICTSE. Furthermore, the results indicated that TSICTSE positively and significantly influences TLICT. The results also revealed that TSICTSE does not mediate between PSICT and TLICT. Finally on the quantitative study, the results showed that there was a significant difference in PSICT between primary and junior high schools. The qualitative results however, indicated that teachers and students were unable to engage in ICT practical lessons due to unavailability of ICT infrastructure, particularly, computer. The findings of the study help understand and ascertain the availability of PSICT and TSICTSE situation in basic schools in Ghana and how they practically affect TLICT. The study recommends that the Ministry of Education should make the provision of appropriate pedagogical support for ICT in basic schools a priority to enhance the teaching and learning of the ICT subject.

CHAPTER ONE

INTRODUCTION

This chapter presents a general introduction to the entire thesis report. The purpose is to provide the reader with a hint of what to expect in the research report. It begins with the background of the study, which highlights the role of ICT education and the pedagogical support for ICT required for the effective teaching and learning of the ICT subject and teachers' and students' ICT self-efficacy in schools in both developed and developing countries of the world. It also briefly highlights the events leading to the introduction of ICT programme in the educational curriculum of basic and senior high schools in Ghana and the rationale behind it. The purpose of the study, the objectives of the study as well as the research questions answered and research hypotheses tested are also presented in this introductory chapter. The chapter further provides the justification for the study, delimitation, definition of terms and finally ends with the organisation of the thesis report.

1.1 Background of the Study

Education in general remains an important tool for transforming and developing a nation. In recent years, however, Information and Communication Technology (ICT) has been one aspect of education that is playing a leading role in the transformational and developmental agenda of nations. It is often said that we now live in a technological world. This is indeed true, considering ICT's impact on modern life and work. Clearly, ICT is controlling the world today. In contemporary days, therefore, no nation can experience the transformation and development it envisages without emphasising and prioritising ICT education – its teaching and learning. Learning ICT skills at school as part of comprehensive education enables one to join the information world (Lindfors,

2007; Hatlevik & Hatlevik, 2018). In view of the pivotal role that ICT is playing in enhancing work and life, and advancing society in general, its teaching and learning is becoming popular not only in the educational curriculum of the western world but also developing countries. Beyond its introduction into the curriculum of most educational systems globally in recent years, pedagogical support for ICT (PSICT) and teachers' and students' ICT self-efficacy (TSICTSE) remain issues of important concern to many education stakeholders because they are presumed to influence the teaching and learning of ICT in schools. It is imperative, therefore, that the issue of pedagogical support for ICT and teachers' and students' ICT self-efficacy become an important topic of discussion and receive serious research attention in the research community in ICT education.

The professional curriculum literature well documents the difficulty of teaching and learning (implementing) a new curriculum programme (Fullan, 1999; Cuban, 1992). The difficulty confronts teachers and students who are the main actors in the process of implementing or delivering any newly introduced subject (curriculum) into practical teaching and learning experience in the classroom (Stenhouse, 1975). All innovations, including the ICT curriculum, bring about some level of incompetence, deskilling teachers and students alike, suppressing acquired competencies and demanding the development of new ones (Fullan, 2007 cited in Cobbold & Ani-Boi, 2011). The implication of this phenomenon is not far-fetched. Once there is a new curriculum, teachers have to do new things in new ways (Cobbold & Ani-Boi, 2011). The demands and pressures associated with implementing (teaching and learning) a new curriculum subject such as the ICT in the classroom makes teachers express lots of concerns in the form of perceptions, feelings, motivations, anxieties about their involvement with the innovation (Armstrong, 2003; Jackson, 1992, cited in Cobbold &

Ani-Boi, 2011). The researcher is of the view that it is not only teachers who may have implementation concerns but also students who are key players in new subject/curriculum implementation in the classroom or school may have similar concerns.

One way to address the concerns of implementers (teachers and students) in new curriculum implementation is to provide them with the adequate support needed in the implementation (teaching and learning) process (Fullan, 2007). One of such crucial support required is the provision of the appropriate pedagogical support for the subject (PSS) to enhance its teaching and learning. However, it appears curriculum developers and education stakeholders do not address these concerns in the curriculum development process (Cobbold & Ani-Boi, 2011). Curriculum developers usually seem to fail to suggest to education stakeholders appropriate support required for implementation, and stakeholders also seems to fail to provide relevant support for new curriculum programme implementation, particularly, appropriate pedagogical support for the subject (PSS), which potentially influences teaching and learning of the subject (TLS). The problem of support for curriculum implementation, particularly, appropriate pedagogical support for the subject, often times, makes teachers and students face challenge in teaching and learning of many new subjects. In fact, in Ghana, implementation of new curriculum programme is a major problem because of inadequate pre-implementation preparation (Derkong-Dery, 2018; Aboagye & Yawson, 2020; Anderson & Esia-Donkor, 2016).

From the foregoing issues highlighted, the researcher is very optimistic that the teaching and learning of the ICT subject/programme in the basic school can suffer a major implementation setback with regard to its teaching and learning if appropriate pedagogical support for ICT (PSICT) is lacking and also teachers and students are not

ICT self-efficacious. The provision of appropriate pedagogical support for ICT (PSICT) and also ensuring that teachers and students are ICT self-efficacious can enhance effective teaching and learning of the ICT (TLICT) subject in schools.

Information and Communication Technology (ICT) 'is an all-encompassing term that includes the full gamut of electronic tools by means of which we gather, record and store information and by means of which we exchange and distribute information to others' (Anderson, 2010, p.4). The United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2010) also defines ICT as the forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means. ICT can, therefore, be interpreted to refer to such technologies as but not limited to internet, intranet, radio, television, video, DVD, mobile phones, line phones, satellite systems, computer and network hardware and software, as well as the equipment and services associated with these technologies, such as videoconferencing, WhatsApp, e-mail and blogs.

As in many other countries, in the year 2007, the Government of Ghana introduced an educational reform. This was the second of two major reforms in education implemented in the country since independence in 1957; the first was launched in 1987 (Cobbold & Ani-Boi, 2011). The 2007 reform was the government's response to recommendation made by a committee that was appointed to review the entire educational system in order to make it relevant to meet national needs. For the basic and senior high school level, one major change the reform brought was the introduction of the Information and Communication Technology (ICT) curriculum (Ministry of Education, Youth and Sports [MOEYS], 2004). The ICT curriculum is offered as a core subject at the basic level but offered as core at senior high school level and at the same time as an elective subject for some students. The rationale for

introducing ICT into the curriculum of basic and high schools is to help develop an Information and Communication Technology culture, knowledge, skills, attitudes, and competencies which are vital for economic development and setting the foundation for higher education in ICT in the 21st century (ICT curriculum, Ministry of Education, Youth and Sports [MOEYS], 2004).

In many countries, research into ICT has taken the centre stage - from ICT integration at work to education, and teaching and learning. Similarly, in Ghana, there is growing research interest in ICT, especially since its introduction into the curriculum of basic and high schools. Despite the many researches into ICT in education to address issues confronting ICT curriculum implementation in Ghanaian basic and high schools, one very important issue that appears to have not been extensively investigated, for which reason not much is known about it, and needs research attention is the pedagogical support for ICT (PSICT) available in basic schools for the teaching and learning of the ICT (TLICT) programme/subject as well as the teachers' and students' ICT self-efficacy (TSICTSE). This is necessary since the few literatures found on support suggest that support received not only ensures successful implementation of a programme but influences the teaching and learning of a subject (Adi, 2010; Arthur, 2017). Also, teachers' self-efficacy for using ICT in their teaching practice is associated with their use of ICT in teaching and their general ICT self-efficacy (Hatlevik & Hatlevik, 2018). Students' ICT self-efficacy is also positively related to their performance in ICT (ICT learning) in school (Hatlevik, Throndsen, Loi & Guomundstottir, 2018). Teachers' and students' ICT self-efficacy can, thus, influence teaching and learning of ICT as a subject. There is the need to expand the literature and extend research knowledge on pedagogical support for ICT (PSICT) and teachers' and students' ICT self-efficacy (TSICTSE), with the view to getting insights and

understanding the influence they have on teaching and learning of the ICT (TLICT) subject in basic schools.

As with all other subjects, the effective teaching and learning and use of ICT in school can be influenced by both internal and external factors. Typically, teacher and student attitude, perception about ICT and its use, ICT self-efficacy can be conceived as internal factors that can influence the teaching and learning of ICT as well as ICT use whilst teacher and student quality, the quality of the teaching and learning environment, quality of supervision, quality of school leadership, and pedagogical support for ICT (PSICT) can be conceived as external factors. Teacher and student motivation, however, can be both an internal and external factor. These internal and external factors among others are what make teaching and learning of any subject effective, including the ICT curriculum (Battistone, Buckmiller & Peters, 2019; Lim, 2004; Darling Hammond, 2000). My interest in this study is to investigate pedagogical support for ICT (PSICT) as an external factor and teachers' and students' ICT self-efficacy (TSICTSE) as an internal factor influence in teaching and learning of the ICT (TLICT) subject in basic schools.

Pedagogical support according to the International Standard Classification for Education (ISCED, 2001) are services provided by professional staff to support students in their instructional programme. These professional staff may include guidance counsellors, librarians, educational media/technology specialists, and attendance officers. Five components of pedagogical support of students' social adaptation are: theoretical and methodological, information-analytical, content-related, technological, management and expert (Vlasova, Simonova & Soleymani, 2015). ICT pedagogy means the effective integration of ICT alongside the curriculum with a new pedagogy which changes the role of teachers and students and increases control in

instruction, learning, self-regulation and collaboration (Hatlevik & Hatlevik, 2018). In this study, the focus is on assessing pedagogical support for ICT (PSICT) and teachers' and students' ICT self-efficacy (TSICTSE) in teaching and learning of ICT (TLICT) in basic school. In this contribution, pedagogical support for ICT in the context of the study operationally pertains to all that is provided or is expected to be provided to ICT teachers and students or made available in the school to assist, encourage, and enhance effective teaching and learning of the ICT subject in basic schools in Ghana (provisions that support or will support teachers and students to effectively teach and learn ICT in the school). Self-efficacy also refers to an individual's belief in his or her capacity to execute behaviour necessary to produce specific performance attainments (Bandura, 1997). Teachers' and students' ICT self-efficacy is their perceived judgments of their capabilities to master and use technologies, such as multimedia, computers, and internet, to achieve instructional and learning purposes (Wang & Zhao, 2021).

The introduction of ICT into the curriculum of basic schools in Ghana obviously means that ensuring its effective teaching and learning and use becomes a primary focus and concern of schools. It also imposes on teachers and students the responsibility to effectively teach and learn ICT as well as be efficacious in the use of ICT. But this goal cannot be achieved without appropriate pedagogical support for ICT available or provided in the schools or to teachers and students for the realisation of this audious task. Since pedagogical support for ICT is critical for effective implementation of the ICT curriculum in the school, it is imperative to be concerned with the availability of key pedagogical support for ICT components in the schools for the implementers (teachers and students) to facilitate the teaching and learning and use of ICT. Pedagogical support for ICT and teachers' and students' ICT self-efficacy in basic schools in Ghana has not been the focus of many previous studies. As a result, there has

been very little or no empirical studies done on pedagogical support for ICT (PSICT) and its key components in the implementation of the ICT programme as well as the teachers' and students' ICT self-efficacy in basic schools. As a result, PSICT availability in basic schools as well as the teachers' and students' ICT self-efficacy is not readily known.

Not much literature is available on pedagogical support for teaching and learning of subject specifics in the school but the few existing literature show that support has influence on the effectiveness of teaching and learning of a subject. For instance, in a study of modelling students' Mathematics interest in Senior High School: The Contextual Ghanaian Perspective, Arthur (2017) reported that pedagogical support provided for mathematics enhanced the teaching and learning of new mathematical content. It can also be said that methods employed by teachers to teach a subject in primary and secondary schools are, to a very large extent, influenced by the kind of resource and facility support available in the school. Implementation of a new instructional programme in the school requires support (Adi, 2010): in this case, the ICT curriculum being implemented in basic and secondary schools in Ghana. The foregoing literature gives credence that pedagogical support teachers and students receive in school in teaching and learning specific subjects is very imperative in achieving the teaching and learning goals and objectives of subjects.

1.1.1 Situation of ICT Teaching and Learning in Basic Schools in Ghana

ICT teaching and learning in terms of pedagogical support for ICT (PSICT) available/received as well as teachers' and students' ICT self-efficacy (TSICTSE) seems not well established due to limited or lack of empirical studies. However, it is not envisaged that the teaching and learning of ICT in the basic school

receive the same or equal level of pedagogical support for ICT as the secondary and tertiary education in Ghana. One does not readily know if there is sufficient and the right kinds of pedagogical support for ICT and if teachers and students are ICT self-efficacious in teaching and learning of the ICT programme/subject in the basic school. This has far-reaching practical implications for the effectiveness of the programme at the basic school level. Literature, however, shows that pedagogical support for ICT (PSICT) as well as teachers' and students' ICT self-efficacy (TSICTSE) can influence or play an important role in effective teaching and learning of ICT in schools. Therefore, one would expect that appropriate PSICT is available at the basic school level and teachers and students become ICT self-efficacious to ensure the effectiveness of the ICT programme, once introduced into the curriculum of basic schools. The seemingly lack of appropriate study into the issue of PSICT and TSICTSE leaves many in the dilemma of not knowing and not being able to ascertain the generality of PSICT available as well as TSICTSE for the teaching and learning of the ICT programme. This can be a major concern for many stakeholders and the teachers and students implementing the ICT curriculum in the classroom. It is against this background that the influence of pedagogical support for ICT in teaching and learning of ICT in basic schools, and teachers' and students' ICT self-efficacy, which are presumed to be key influences of ICT teaching and learning, emerged a topic of interest for investigation by the researcher.

1.2 Statement of the Problem

The purpose of introducing ICT as a subject of study into the curriculum of pre-tertiary schools in the 2007 educational reforms in Ghana was to enable students acquire basic technological knowledge and skills that will make them useful, functional, and

productive in the modern world of work and life (ICT curriculum, Ministry of Education, Youth and Sports [MOEYS], 2004). To achieve this goal, the teaching and learning of the ICT subject must be effective in the schools.

The overriding question to answer in this research has to do with what is the influence of pedagogical support for ICT and the mediating role of teachers' and students' ICT self-efficacy in effective teaching and learning of ICT in basic schools in Ghana.

In a study of modelling students' Mathematics interest in Senior High Schools: The Contextual Ghanaian Perspective, Arthur (2017) reported that pedagogical support provided for mathematics enhanced the teaching and learning of new mathematical content. Teachers' and students' self-efficacy is also important for the teaching and learning of ICT. Teachers' self-efficacy for using ICT in their instructional/teaching practice is associated with their use of ICT in teaching and their general ICT self-efficacy (Hatlevik, 2018). Hence, it is assumed that pedagogical support for ICT (PSICT) and teachers' and students' ICT self-efficacy (TSICTSE), arguably, can enhance effective teaching and learning of ICT (TLICT) subject in school environments including the context of basic schools in Ghana. In the presumptive influence of PSICT on TLICT however, it is not known whether or not teachers' and students' ICT self-efficacy (TSICTSE) mediates the relationship.

The introduction of the ICT programme has necessitated the building of computer laboratory in some schools (Mereku, Yidana, Hordzi, Tete-Mensah, & Williams, 2009) and teachers have been participating in ICT training workshops to facilitate the successful teaching and learning of ICT in school (Sarfo, Amankwah, & Konin, 2017). However, evidence in the literature (Gulbahar, 2007; Salomon, 2002; Sarfo & Elen, 2008; Sarfo & Ansong-Gyimah, 2011; Inan & Lowther, 2010) on the introduction of

ICT into the curriculum of schools in Ghana show that, in spite of some investments, ICT teaching and learning in the school system in Ghana, as in many developing countries, has not been effective as expected. This claim is supported by many research findings (Peprah, 2016; Ayeh, 2009; Boni, 2018; Sey, 2013; Malcolm & Godwyll, 2015; Acquah, 2012; Natia & Al-hassan, 2015) that report serious challenges hindering the quality of implementation (teaching and learning) of ICT in pre-tertiary educational institutions in Ghana, particularly at the basic level. While effective teaching and learning of ICT remains a major challenge in basic schools in Ghana, it is important to understand how the provision of appropriate pedagogical support for ICT (PSICT) and teachers' and students' ICT self-efficacy (TSICTSE) influence the teaching and learning of ICT (TLICT) in basic schools in Ghana.

More recently, research into ICT education has been overwhelming (Jehan, Alandejani & Basri, 2018). Issues relating to ICT use in education (eg. Ghavifekr & Rosdy, 2015; Murithi & Yoo, 2021; Ghavifekr, Kunjappani & Ramasamy, 2016), ICT as pedagogical tool for teaching and learning (eg. Machumu, Kimaro & Almasi, 2018; Yunus, Nordin, Salehi, Embi & Salehi, 2014), ICT integration in education (eg. Wijayasundara, 2020), challenges of ICT use (eg. Habibu, Al-Mamum & Che, 2012; Salehi & Salehi, 2012), teachers' ICT self-efficacy (eg. Gbemu, Sarfo, Adentwi & Aklassu-Ganan, 2020; Teo & Koh, 2010; Sarfo, Amankwah & Konin, 2017; Hatlevik & Gudmundsdottir, 2018; Hatlevik & Hatlevik, 2018; Rohatgi, Scherer & Hatlevik, 2016; Hatlevik, Throndsen, Loi & Guomundstottir, 2018), access to ICT for teaching and learning (eg. Czerniewicz & Brown, 2005), ICT role and use in school (eg. Mikre, 2011; Fu, 2013) etc. have been studied in many different contexts. Studies examining most of these issues have yielded inconsistent and contradictory results. This notwithstanding, the issue of pedagogical support for ICT (PSICT) and teachers' and

students' ICT self-efficacy (TSICTSE) influence in teaching and learning of ICT (TLICT), particularly in the context of basic schools in Ghana, however, does not appear to have been investigated.

Girija, Meena, & Asokumar (2020) studied the impact of ICT as a pedagogical tool (tool for teaching and learning/tool use for teaching and learning) in higher education. The objective of the study was to understand how the use of ICT as a teaching tool influenced students' performance and enhanced teaching methods. It was found that there was influence of projector, presentation software on teaching attitude in higher educational institutions in Chennai. Again, the study found that there was influence of projector and teaching attitude on students' performance in higher educational institutions in Chennai. Though this study relates to pedagogy, it specifically looked at ICT as pedagogical tool for teaching and learning but did not focus on pedagogical support for ICT (PSICT) influence in teaching and learning of ICT (TLICT) in basic schools in Ghana and the mediating role of teachers' and students' ICT self-efficacy, and so does not address the problem that the present study seeks to address.

ICT as a pedagogical tool pertains to ICT tools and resources as well as applications/programmes that are employed to teach or learn a content (Aliaga-Polo, 2022) regardless of the subject. In this study, the concept of pedagogical support for ICT (PSICT) is operationally defined to pertain to all forms of provisions made available to schools or teachers and students that provide or are oriented to provide support for the teaching and learning of the ICT subject in the school. Pedagogical support for ICT (PSICT) which this study will focus investigating include ICT tools and resources such as computer, projector, and internet (ICT infrastructure); ICT training; teaching and learning resources for ICT; physical facilities that aid/support

teaching and learning of ICT; and incentive packages to provide motivation for teaching and learning of ICT.

Considering the preliminary literature reviews, the following major gaps and shortcomings have been identified regarding pedagogical support for ICT and teachers' and students' ICT self-efficacy in teaching and learning of ICT in schools, which this study will address.

1. In general, there is seemingly perception that schools in developing countries (teachers and students) historically have not been provided with the adequate pedagogical support required to effectively teach and learn, in terms of (resources/materials, facilities, training and incentive packages for motivation) let alone providing adequate support (pedagogical support) for the teaching and learning of ICT in the school which, according to Asiedu-Addo, Apawu, and Owusu-Ansah, (2016) is expensive.
2. Also, as indicated earlier, the findings of Arthur (2017) showed that pedagogical support provided for Mathematics enhanced the teaching and learning of new Mathematical content. It is not however, known whether pedagogical support for ICT also influence teaching and learning of ICT empirically.
3. It appears that in Ghana, there has not been a study conducted in relation to effectiveness of ICT teaching and learning, and there are limited studies conducted on ICT self-efficacy beliefs (eg. Caesar & Teye, 2012; Obiri-Yeboah, Owusu-Kwarteng & Kyere-Djan, 2013; Gbemu, Sarfo, Adentwi & Aklassu-Ganan, 2020; Sarfo, Amankwah & Konin, 2017). The objective of the few studies mentioned all focused on ascertaining teachers' ICT/computer self-efficacy beliefs and not the influence of teachers' and students' ICT self-efficacy in teaching and learning of ICT as well as the mediating role of

teachers' and students' ICT self-efficacy in the influence of PSICT on TLICT in basic schools in Ghana.

4. It appears that most of the national and international studies on ICT in general as well as in the particular context of ICT education, the research designs mostly used, have been surveys and case studies which have employed quantitative or qualitative approaches but not necessarily the mixed method approach (World Bank, 2013; Alameen, Male, & Palaiologou, 2015). The sequential explanatory mixed method design, particularly, does not appear to have been widely used.
5. Also, the sample/participants used in most of the studies in ICT (eg. Teo & Koh, 2010; Peprah, 2016; Boni, 2018; Malcolm & Godwyll, 2015; Sarfo, Amankwah & Konin; 2017; Gbemu et al., 2020) were either teachers or students. Seemingly, there is limited or no study that both teachers and students were used as sample or participants in one single study.
6. It also appears that most ICT researchers in Ghana reduce the scope of their studies to one school, one district/ municipality/ metropolis/region (eg. Anderson & Donkor, 2016; Peprah, 2016; Girija, Meena, & Asokumar, 2020; Ayeh, 2009; Boni, 2018; Sey, 2013; Malcolm & Godwyll, 2015; Acquah, 2012; Natia & Al-hassan, 2015; Sarfo, Amankwah & Konin; 2017; Gbemu, et al., 2020). There is need to extend the geographical scope of studies in ICT to make the findings nationally representative.
7. Also, there is seemingly scanty literature and low research (eg. Arthur, 2017; Adi, 2010) on pedagogical support for teaching and learning of subject specifics including the ICT. The few literature available however, indicates that pedagogical support received enhance the teaching and learning of a subject as well as the implementation of a new curriculum programme. This means that

there is need to expand literature on the influence of pedagogical support on teaching and learning of subject specifics in the schools, particularly, the ICT subject in basic schools.

The present study, therefore, sought to fill these voids in terms of contribution to literature, methodology, research focus, scope and empirical findings, regarding understanding the availability of pedagogical support for ICT (PSICT) influence in teaching and learning of ICT (TLICT) and the mediating role of teachers' and students' ICT self-efficacy (TSICTSE in the specific context of basic schools in Ghana.

1.4 Purpose and Objectives of the Study

1.4.1 Purpose of the Study

The goal of the ICT curriculum at the basic school can be achieved only when teachers effectively teach and students effectively learn and demonstrate competency in ICT use. Correspondingly, it is important to understand the role of pedagogical support for ICT influence as well as teachers' and students ICT self-efficacy in the teaching and learning of ICT in the realization of the goal of the ICT curriculum.

The purpose of the study is, therefore, to assess and understand influence of pedagogical support for ICT on teaching and learning of ICT in basic schools in Ghana. It is also to understand the mediation role of teachers' and students' ICT self-efficacy in the relationship between PSICT and TLICT in order to fill the gaps identified in the literature.

1.4.2 Objectives of the Study

In order to be able to achieve the purpose of the study, the following need to be pursued:

1. Assess the availability of pedagogical support for ICT (PSICT) in teaching and learning of the ICT subject in basic schools.
2. Find out if the teaching and learning of the ICT subject in basic schools in Ghana is effective.
3. Assess teachers' and students' ICT self-efficacy in basic schools in Ghana.
4. Examine the influence of pedagogical support for ICT (PSICT) on teaching and learning of ICT (TLICT) in basic schools.
5. Examine the influence of pedagogical support for ICT (PSICT) on teachers' and students' ICT self-efficacy (TSICTSE) in basic schools in Ghana.
6. Investigate the influence of teachers' and students' ICT self-efficacy (TSICTSE) on teaching and learning of ICT (TLICT) in basic schools in Ghana.
7. Examine the mediation role of teachers' and students' ICT self-efficacy (TSICTSE) in the influence of pedagogical support for ICT (PSICT) on teaching and learning of ICT (TLICT) in basic schools.
8. Examine if there is significant difference in pedagogical support for ICT (PSICT) between primary and junior high schools in Ghana.

1.5 Research Questions and Hypotheses

In order to achieve the objectives of the study, the following research questions and research hypotheses were formulated to undergird the study.

1.5.1 Research Questions

1. To what extent is appropriate pedagogical support for ICT (PSICT) available in the teaching and learning of ICT in basic schools in Ghana?

2. How effective is the teaching and learning of ICT in basic schools in Ghana?
3. What perception do basic school ICT teachers and students have about their ICT self-efficacy?
4. What is the influence of pedagogical support for ICT (PSICT) on teaching and learning of ICT (TLICT) in basic schools in Ghana?
5. What is the influence of pedagogical support for ICT (PSICT) on teachers' and students' ICT self-efficacy (TSICTSE) in basic schools in Ghana?
6. What is the influence of teachers' and students' ICT self-efficacy (TSICTSE) on teaching and learning of ICT (TLICT) in basic schools in Ghana?
7. What is the mediation role of teachers' and students' ICT self-efficacy (TSICTSE) in the influence of pedagogical support for ICT (PSICT) on teaching and learning of ICT (TLICT) in basic schools in Ghana?
8. Is there significant difference between the pedagogical support for ICT (PSICT) in primary and junior high schools in Ghana for teaching and learning of ICT (TLICT)?

1.5.2 Research Hypotheses

In order to answer research question 4 to 8, five alternative hypotheses ($H_1 - H_5$) were formulated and tested.

H₁. Pedagogical support for ICT (PSICT) significantly influences the teaching and learning of ICT (TLICT) in basic schools in Ghana.

H₂. Pedagogical support for ICT (PSICT) significantly influences teachers' and students' ICT self-efficacy (TSICTSE) in basic schools in Ghana.

H₃. Teachers' and students' ICT self-efficacy (TSICTSE) significantly influences the teaching and learning of ICT (TLICT) in basic schools in Ghana.

H4. Teachers' and students' ICT self-efficacy (TSICTSE) mediates the relationship between pedagogical support for ICT (PSICT), and teaching and learning of ICT (TLICT) in basic schools in Ghana.

H5. There is significant difference between the pedagogical support for ICT (PSICT) in primary and junior high schools in Ghana for teaching and learning of ICT (TLICT).

1.6 Justification/Significance of the Study

With the world increasingly becoming more information-and-communication-technology driven, it is imperative for schools to effectively teach and ensure students effectively learn and apply ICT knowledge, skills and competencies that will enable them to be part of the information and technology society and function effectively. In this regard, a study of influence of pedagogical support for ICT on teaching and learning ICT, and teachers' and students' ICT self-efficacy in basic schools in Ghana is necessary for several reasons.

The study will contribute significantly to improving the effectiveness of ICT education, especially in Ghana and in other developing countries. Essentially, the outcome of the study will inform education stakeholders, especially government, about the state of ICT education (in terms of the pedagogical support the programme receives, its effectiveness as well as teachers' and students' ICT self-efficacy) to influence policy development and interventions to improve ICT education in basic schools.

It is also envisaged that the study will draw the attention of stakeholders to the importance of pedagogical support for ICT in teaching and learning of the ICT subject.

Additionally, it will also provide a comprehensive model/framework and instruments for assessing pedagogical support for ICT required for the teaching and

learning of ICT. The effectiveness of ICT teaching and learning and teachers' and students' ICT self-efficacy in basic schools will also be known.

It will help expand the seemingly limited literature on pedagogical support for teaching and learning of subjects, with particular reference to ICT as a subject of study in the basic school curriculum. The study, therefore, will make much contribution to theory and practice of ICT education in Ghana and other educational systems especially in Africa and other developing countries.

1.7 Delimitation of the Study

The study was conducted with utmost rigour using a large sample size of 620 participants drawn from 300 basic schools across the 10 traditional regions of Ghana for countrywide representativeness. Nevertheless, there were some delimitations in the conduct of the study. They are as follows:

1. The study focussed only on influence of pedagogical support for ICT on teaching and learning of ICT as well as teachers' and students' ICT self-efficacy without exploring other factors such as teachers' and students' ICT interest, experience, socio-economic background, gender, and age influence on teaching and learning of ICT at the basic schools.
2. The study relied only on the sequential explanatory mixed method and not the other types, which could equally have been chosen.
3. A longitudinal study would have been ideal for a study of this nature but with the limitations of time, a cross-sectional study was preferred.
4. The study was confined to 10 districts and 300 basic schools out of the over 200 districts and thousands of basic schools in Ghana. However, the researcher cherishes the hope that since the sample schools and for that matter the participants were selected from the two main sectors of Ghana (Northern and

Southern) and all the 10 traditional regions of Ghana involved, the study would yield valid and reliable results from which a degree of generalisation could be made to all the basic schools in Ghana.

1.8 Definition of Terms

Information and Communication Technology (ICT) – It means electronic devices or technological equipment for collecting, processing, storing, retrieving and communicating information, such as computer hardware and software, network, video, audio, television, digital camera, WhatsApp, video conferencing, etc.

Pedagogical support for ICT– This pertains to all forms of provisions/assistance (ICT tools & equipment, resources & materials, facilities, training, incentives) that are essentially required or made available in the school or to teachers and students to facilitate and enhance the teaching and learning of ICT as a subject of study in the school.

Teaching - The process by which teachers assist or guide students to learn and acquire new knowledge, skills and attitudes

Learning – A relatively permanent change in behaviour or cognition that occurs as learners construct knowledge through active exploration and discovery in their physical social environments

Basic school – Kindergarten, primary and the junior high school of an educational system where schools teach students' basic and fundamental knowledge needed to further their education at the secondary and eventually continue in higher institutions of learning

Rural basic school – Per the description of Ghana Education Service (GES), it is a basic school found in a location where the socio-economic status of parents is low –

SES (MOE, 2018) with small population, and absence of basic social amenities and facilities.

ICT infrastructure - The ICT tools, such as hardware, software, internet access and other similar resources and peripheral equipment, provided in the school for ICT teaching, learning and use

Training - A systematic programme or process for the development of knowledge, skills and behaviour required by employees or people to do adequately on a confirmed task or job

Incentive – It means financial, material and non-material inducements that encourage an individual to contribute his maximum effort to work at an optimal level of expectation.

Teaching and learning resources (TLR) - Tools, materials and resources in the school that aid teaching and learning in an instructional sequence

Assessment - The collection of information about student learning attained for the purpose of making educational decisions about children or group of children or to evaluate a programme's effectiveness

Curriculum – A programme, course, subject or the teaching and learning experiences of schools

Implementation - The open use of a programme by individuals and institutions targeted to use it

Mixed methods research – A combination of quantitative and qualitative research approaches into a single style research for the purpose of triangulation

1.9 Organisation of the Thesis

This study on influence of pedagogical support for ICT (PSICT) on teaching and learning of ICT (TLICT) and mediation of teachers' and students' ICT self-efficacy (TSICTSE) in basic schools in Ghana is structured into six distinct chapters. Each chapter deals with a unique aspect of the study. The stuff contained in each chapter is briefly explained beneath.

Chapter One

This is the introductory chapter of the entire thesis and is titled 'Introduction'. Its purpose is to provide the reader with a hint of what to expect in the entire document. The chapter further covers the background and statement of the research problem, the purpose and objectives of the study, and the research questions and research hypothesis of the study. Also included in this chapter is the significance of the study, the delimitation of the study, definition of key terms in the study plus the structure of the entire thesis report.

Chapter Two

Chapter Two forms the first part of a two-part literature review and is titled 'Education in Ghana, Reforms and the ICT Curriculum'. This chapter of the study presents factual information about the country Ghana, the Ghana educational system, the Ghana Education Service, the concept of basic education, brief history of education in Ghana, major educational reforms and the ICT education curriculum introduced by the 2007 reform, which is the focus of this study.

Chapter Three

Chapter Three also contains literature and is titled ‘Pedagogical Support for ICT and ICT Self-Efficacy in Teaching and Learning of ICT’. This chapter focusses on reviewing the conceptual, empirical and theoretical literature for exploring and understanding pedagogical support for ICT teaching and learning, and ICT self-efficacy of teachers and students in schools worldwide, including Ghana. The essence of the chapter is to provide deeper understanding of the concepts of the study, identify the research gaps, and to direct and carefully position the study.

Chapter Four

Chapter Four of the study details out the research methodology and design used to collect and analyse data. The chapter further discusses how the empirical study was designed and conducted. The chapter again tries to justify the research design used. Research instruments used to collect and analyse data are described and explained further.

Chapter Five

Chapter Five captures the results and discussions. The chapter analyses and presents the data collected to find answers to the research questions raised in the study as well as test the research hypothesis and discusses the results of the study. The data was analysed using descriptive and inferential statistics by means of SPSS 23.0 version and AMOS. Direct comments made by the participants in the qualitative study, which followed the quantitative study, were analysed thematically and included in the analysis. Discussion of the results was done after both quantitative and qualitative data were analysed, presented and interpreted.

Chapter Six

This is the final chapter and presents the concluding part of this study. It provides a summary of the key findings of the study and conclusions drawn based on the research findings. It also makes recommendations for practice and suggestions for further research.

CHAPTER TWO

EDUCATION IN GHANA, REFORMS AND THE ICT CURRICULUM

This chapter is the first part of a two-part literature review. The chapter presents factual information about the country Ghana, the Ghana educational system, the Ghana Education Service, brief history of formal education in Ghana, the concept of basic school, major educational reforms and the ICT education curriculum, which is the focus of this study.

2.1 The Country Ghana

A country is a region identified as an area with a distinct political administration which is a sovereign or part of a larger state (Worlddata.Info). This means that a land which has a well-defined territory and government is a country. In Dictionary.Com, a country implies the people living in a defined territory under a central authority. This means, a country is defined by distinct factors which are: having a defined territory, government and people. According to the United Nations (UN), there are currently 195 countries in the world of which Ghana is one (Zmescience.Com). Ghana can be located north of the Gulf of Guinea and the Atlantic Ocean in the West African sub region. It is bordered by the Gulf of Guinea and the Atlantic Ocean in the south, La Cote d'Ivoire in the west, Burkina Faso in the north, and Togo in the east.

The country was colonized by the British from 1821 to 1957 when it became the first country in sub-Saharan Africa to gain independence (Derrick & Barrie, 2020; Wikipedia). The Queen of Britain continued to be the head of state of independent Ghana until 1st July 1960 when Ghana became a republic (Derrick & Barrie, 2020). Henceforth, the country has been going through social, economic, political and educational transformations from the first republic to the fourth republic.

2.1.1 Socioeconomic Development of Ghana

Education in Ghana pre-dated the founding of the Gold Coast. Informal education which involves the training of individuals into various aspects of life of the society has been part and parcel of the life of the local people before the coming of the Europeans to Africa (Oti-Agyen, 2007; Derrick & Barrie, 2020). According to Oti-Agyen (2007) and Derrick & Barrie (2020), informal education is not structured along any formal policies and strategies to streamline the education of the indigenous people. Rather, all adult men and women in the communities are instructors who teach the young ones what society desires, which were essentially to learn core tribal values in the fields of security, economy, health, and social life in general. Much attention is centred on the learning of apprenticeship which gives practical skills in the occupation of the parents (Edusei, 2004), where the father is a farmer, children are given training in farming. In the same vein, a fisherman or fishmonger gives training in their respective occupation to the children just like a carver and a weaver would do. In modern days, however, this informal (traditional) way of providing education and training to the people of Ghana is hugely complemented by formal and non-formal education.

2.2 Educational System and Structure in Ghana

The system of education as well as the structure in pre-colonial, colonial and post-colonial Ghana has not been the same. By educational system, one is looking at how education is organised in the country and by educational structure the duration of education or years spent by one to acquire education. It is instructive to note that different educational systems and educational structures have existed at different times in Ghana as the exigencies of the day demanded. Reforms and curricula change

therefore, have been a major feature in the educational front over the years all with the aim of making the educational system better to meet the needs of the country or the citizenry.

2.2.1 Educational System and Structure in Pre-colonial Ghana

To educate is to expose someone to new “experiences, ideas, skills, customs, and values” (Adu-Gyamfi, Donkoh & Addo, 2016, p. 158) so that they are integrated into human society. These objectives were the core curriculum of informal education in Ghana before the arrival of the white man. Education in Ghana predated the presence of the Europeans in the land from 1471 to 1957 (Derrick & Barrie, 2020). As indicated above, in pre-colonial Ghana, the system of education was purely informal. In this system of education, there were no formal schools with formal systems and structures to provide systematic and tailored education. Informal education in the form of primary socialisation was done in line with unstructured norms and values (Derrick & Barrie, 2020). There were no consciously designed syllabi, classrooms, specialised courses to equip the trainee in a specific field exclusively a farmer, a hunter, a fisherman, a blacksmith or a goldsmith, and craftsman or woman among others as done in the formal school system (Oti-Agyen, 2007). He adds that teaching and learning methodologies were observation, imitation and participation. In this regard, the researcher posits that informal education was mainly based on apprenticeship training. It is also instructive to know that, in terms of educational structure, informal education is not time bound. One could therefore hardly tell when he or she starts education (undergoing the informal curriculum) and the time he or she completes. This characteristic of informal education is perhaps because of the fact that teaching and learning under the system was by observation, imitation and participation as alluded by Oti-Agyen (2007).

It is obvious that traditional education gives individuals holistic training to fit in any field of social life. Its overarching objective was to equip members of society with the necessary skills to fit into society so that one could decide their own life path at a certain stage of development (Oti-Agyen, 2007). To this extent, traditional education reduces unemployment in society and ensures the overall functioning of the social system. However, traditional or informal education does not give specialised training to fit in any particular field to meet the demands of contemporary society. This makes the trainee a jack of all trade but a master of none as the common maxim puts it. Throughout the years that the natives live in the land of Ghana, traditional education was the sole form of education used to integrate people into social life.

2.2.2 Pre-university Structure of Formal Education System in Independence and Post-independence Ghana

The colonial government administration's educational system and structure run in Ghana during independence was similar to the system practised in their motherland. The system of education during independence was structured into three: elementary school (primary and middle school), secondary school (form five and six form) and tertiary (University).

The duration of elementary school education was ten (10) years (6years primary school education and 4years middle school education). The duration of secondary school education was seven (7) years. The first part of secondary school, referred to as form five or 'O' Level, was five years and the second part, referred to as sixth form or 'A' Level, was for a duration of two years. Tertiary education (University education) was for a minimum duration of four years. At the middle school, students wrote the Middle School Leaving Certificate Examination and were awarded the Middle School

Leaving Certificate, which was used to gain admission into secondary schools to do their O'Level programme. At the form five level, students wrote the Ordinary Level examination and were awarded the Ordinary Level Certificate, which was used to obtain admission to sixth form or post-secondary (teacher training college). At the sixth form level, students wrote the Advanced Level Examination and were awarded the Advanced Level Certificate, which was used to secure admission into the University. The structure of pre-university education at independence was therefore 6: 4: 5: 2 (17 years); thus, 6years primary school education, 4years middle school, 5years form five and 2years sixth form.

It is instructive to note that the structure of pre-university education, as described above, was maintained by both the Kwapong Educational Review/Reform Committee in 1967 and the Dzobo Educational Review/Reform Committee in 1973, though the content of education changed.

However, this old structure of pre-university education was changed in the 1987 educational reform based on the recommendations of the Anfom educational review/reform committee to 6: 3: 3 (12 years). This means the duration of pre-tertiary education at the time was reduced by five years (17 to 12 years), and this structure existed until the 2007 educational reform.

In 2007, the government, through the recommendations of the Anamoah-Mensah educational review/reform committee, changed the structure of pre-university education from the 6: 3: 3 to 2: 6: 3: 4. Thus, 2 years of kindergarten, 6 years of primary school education, 3 years of Junior High School education and 4 years of Senior High School education with the Junior Secondary School (JSS) and the Senior Secondary School concept also changing to Junior High School (JHS) and Senior High School respectively. But this structure, which became operational in 2008, has been revised to

2: 6: 3: 3 by a legislative instrument by President John Evans Atta Mills's NDC government in 2009. According to Adu-Gyamfi, Donkor and Addo (2016) the existing structure of education system in Ghana comprises six (6) years of primary education made up of three (3) years lower and three (3) years upper; three (3) years Junior High School, three (3) years Senior High School and four (4) years university (6: 3: 3: 4). However, the researcher adds that based on the 2007 educational reform structure and the subsequent legislative instrument to revise same, 2 years of kindergarten education is now part of the formal school system and operational at the basic level. Also, the duration of university education at least for a first degree programme ranges from a minimum of two (years) to a maximum of seven (7) years depending on either entry qualification or the programme one pursues. Figure 2.1 is the researcher's depiction of the current structure of formal education in Ghana.

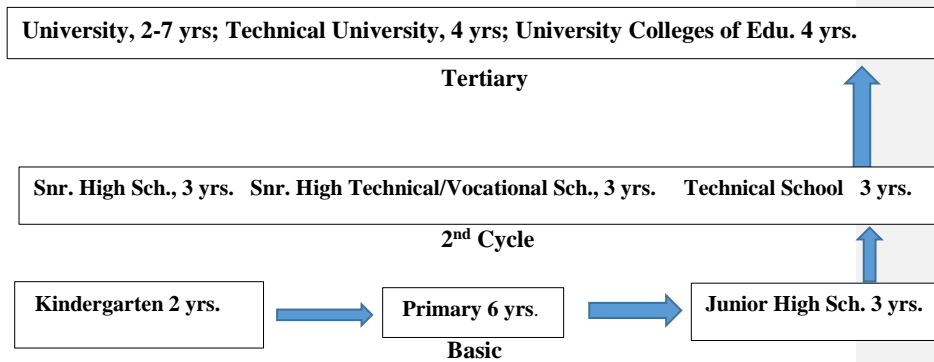


Figure 2.1: Graphical Representation of Ghana's current Formal Educational System and Structure

2.2.3 Basic Education or School

Globally, Basic Education refers to the minimum learning that an individual requires for effective or meaningful participation in a modern society. The limits of Basic Education are variously determined in different countries. For example, in the USA, Great Britain, Canada and many other advanced countries, basic education ends with a bachelor's degree at the university (Adentwi, 2017).

In Ghana, currently basic education spans the first eleven years of schooling, made up of two (2) years of kindergarten, six (6) years of primary school and three (3) years of Junior High School. The Evans-Anfon Educational Review Commission of 1986 defined Basic Education in Ghana as the minimum formal education which every Ghanaian child is entitled to as a right to equip him/her to function efficiently. The Anamoah –Mensah Educational Reform/Review Committee Report of 2002 also defined basic education as the minimum period of schooling needed to ensure that children acquire basic literacy, numeracy, and problem-solving skills for creativity and healthy living. Currently in Ghana, basic education is supposed to end with the Basic Education Certificate Examination (BECE) at the Junior High School level. It is as a result of the belief that this level of education is really not adequate to provide the basic school leaver with employable skills and effective skills for a meaningful adult life that the present government seeks to uplift basic education to the Senior High School status through its fee-free Senior High School policy.

The purpose of basic education in Ghana, already stated, includes the acquisition of literacy, numeracy, socialisation, problem-solving, inquiry and creativity skills, among other things. These purposes are realised not only through the formal systematic study of the academic disciplines or taught courses, but also through co-curricular activities such as games and sports, church service, club and society

meetings, entertainment sessions, morning devotions, excursions and study trips, as well as through the so called “hidden curriculum”. It can be said that the philosophy of basic education in Ghana is to mould the ethical and moral character of the learners and to equip them with the intellectual skills and attitudes for further education and world of work. It is this level of education in Ghana that this research study focusses on.

2.3 Advent of Formal Education in Ghana and the Castle Schools

The presence of the Europeans necessitated formal education in line with the type of education in the European countries (Derrick & Barrie, 2020). Then, the main objective of education was to train people as interpreters and missionary workers. Importantly, the Europeans wanted to train clerks who would assist them in their trading activities. The Portuguese were the first Europeans to arrive at the shores of Ghana in 1471. They continued to stay and engage their trading activities until their departure in 1642. The other Europeans to come to Ghana for trade and other purposes were the Dutch (1580–1872), the Swedes (1640–1663), the Danes (1674 to 1850), Brandenburgers of the then Prussia (1682–1721) and the British (1631–1957) (Derrick & Barrie, 2020). It was only a matter of short time when the introduction of formal education became necessary because the whites must communicate with the indigenous people effectively. This necessitated the establishment of castle schools to achieve the purpose (Derrick & Barrie, 2020; Oti-Agyen, 2007).

School refers to the formalised, structured and systematic educational process whereby instructors and learners interact to accomplish teaching and learning (Edusei, 2004). This means that the school has certain features and not every form of learning or education could be described as a school. In the school system, teaching and learning is structured based on a formalised curriculum. Teaching and learning is systematically

arranged to achieve set objectives. Teaching and learning also take place at given places during specific periods of time. In this regard, the system of teaching and learning in the Gold Coast school system has been labelled “The castle schools” (Andoh 2008; p. 87), because it reflects the structural patterns of a school system outlined above.

Castles and forts were primarily built to house European merchants and to serve as depot for keeping goods and, later slaves, before shipment to Europe and other parts of the world (Oti-Agyen, 2007). However, as the Europeans continued to live in the Gold Coast, it became necessary to educate the mulatto and African children especially children of local chiefs; hence, the incorporation of the formal school system into the castles (Edusei, 2004; Kushner & MacLean, 2015). The first castle school in the Gold Coast was the Elmina castle school set up in 1529 by the Portuguese (Edusei, 2004; Andoh, 2008) under the instruction of King John III of Portugal (Andoh, 2008). According to Andoh (2008), the king instructed the Portuguese governor in the Gold Coast to convert the local people to Christianity and to ensure that children born to the whites by black African women were also brought to the fold of the Christian faith. Therefore, one major aim for introducing formal education in the Gold Coast was to Christianise the local people. Andoh adds that teaching the children reading and writing was also part of the instruction of the Portuguese king. Thus, the curriculum of the first school in the Gold Coast emphasised the teaching of the three Rs – reading, writing and arithmetic (Finlay, 1971; Edusei, 2004; Andoh, 2008).

As observed above, the Portuguese had the pioneering work in setting up castle school in the Elmina castle in 1529 to provide the educational needs of mulatto children and some selected African children. Later, the other Europeans in the Gold Coast also built forts and castles and followed the footsteps of the Portuguese to establish schools in their various castles (Edusei, 2004). According to Edusei (2004), the Dutch, the

Danes and the British separately started schools in their respective castles. The Dutch continued the castle school at Elmina after capturing it from the Portuguese in 1637. The Danes also had a school at the Christiansburg Castle in Accra, and the British had a school in the Cape Coast Castle in Cape Coast (Oti-Agyen, 2007).

It is conclusive that castle schools constituted the prototype of the school system in the Gold Coast, now Ghana. With a pioneering castle school by the Portuguese in 1529, the other Europeans such as the Dutch, Danes, and the British also started castle schools in their respective forts and castles in the Gold Coast. The teaching of the three Rs was the core of the curriculum of the castle schools as people were being trained as interpreters, catechists and clerks (Andoh, 2008). Even though, the castle schools have served the country by providing grammar-based education, they lacked much of vocational and technical training that propel a country's development agenda. Recognising the significance of vocational and technical education, prior to the independence of Ghana in 1957, reforms in the educational system incorporated industrial and agricultural skills (Finlay, 1971; Andoh, 2008). And after independence, the need to shift emphasis of education from grammar to vocational and technical education became apparent. The shift of attention to vocational and technical courses perhaps is because the purpose or objective of the formal school system in contemporary society is the promotion of professional development of learners. This explains the stress on technical, vocational and technological programmes in modern educational systems and the need for support to ensure effective teaching and learning of these courses/subjects.

2.4 Contemporary Developments in Ghana's Education System

The education system of Ghana has been going through a lot of developmental changes from independence in 1957. These developments seen in the educational sector ultimately aimed at improving access, quality and management. It is said in the literature that there were many changes in the country's education system as there were many governments to initiate those changes (Adu-Gyamfi, Donkor & Addo, 2016). Developments in the educational sector such as the introduction of free Compulsory Universal Basic Education (fCUBE), Capitation Grant (CG) to basic schools, the establishment of the Ghana Education Trust Fund (GETFUND), the upgrade of some existing secondary schools and the establishment of Community Day Schools (CDSs), and the introduction of Free Senior High School (FSHS) aimed at increasing access and quality. One of the peaks of the developments in Ghana's education system with respect to education management is the establishment of the Ghana Education Service (GES) as the authority to oversee the management of education at the pre-tertiary level (<https://ges.gov.gh>).

2.4.1 The Ghana Education Service

The Ghana Education Service (GES) was established by the legislative instrument NRCD 247 in 1974. It was named the Ghana Teaching Service (GTS) (Adu-Gyamfi, Donkor and Addo, 2016) when it was initially created under the leadership of President Ignatius Kutu Acheampong by the Dzobo Committee. It has gone through several amendments by NRCD 252 and 357. Several acts of parliaments – Act 506 (1994) and Act 778 (2008) – amended the earlier legislative instruments. The service is managed by a fifteen-member council.

The mission of the GES is to ensure that all Ghanaian children of school age are provided with inclusive and equitable quality formal education and training through effective and efficient management of resources to make education delivery relevant to the manpower needs of the nation (GES Act 778, 2008). To achieve this mission, the body is given the mandate to ensure the implementation of all approved national educational policies initiated or formulated by the Ministry of Education (MoE) for the attainment of national educational goals at the pre-tertiary level of education. The GES is headquartered in Accra and headed by the Director General who is assisted by two Deputies – Deputy Director General (Managerial Services) and Deputy Director General (Equitable Access). For operational purposes, there are fourteen divisions and directors at the headquarters each with their roles. It also has 16 regional directors and 116 district directors of education respectively. The body has four broad-based programmes – pre-tertiary education management from the headquarters in Accra through to the regional and district directorates; basic education from pre-school to the primary and junior high schools; secondary education from senior high schools to the technical and vocational schools; and special and inclusive education. The key objectives of the public service body are to increase access to education at all levels; ensure the provision of life skills training and personal hygiene, family life education, gender, health, and venereal diseases; improving the quality of teaching and learning; and the management of education service delivery in the country.

The key challenges of the body are the problem of finance as the chunk of its budget is used to pay staff salaries, thus crowding out other equally important expenditures. Shortage of teachers in deprived areas as well as teachers for specific technical subjects such as chemistry, ICT and pre-technical skills, infrastructure and facilities are other challenges to the body. There are also logistical challenges for

monitoring and supervision as well as the delivery of in-service training among many others (Culled from <http://ges.gov.gh>).

2.5 Educational Reforms in Ghana after Independence

The term 'reform' implies a calculated and well-worked attempt to identify and correct an inherent problem in a system. In highlighting the term reform, Adu-Gyamfi, Donkor and Addo (2016; 158) comment that reform is an "intended or enacted attempts to correct an identified problem". This simply means that the need for reforms connotes the existence of a problem in a system. In this regard, educational reform is the new changes and policies introduced into a country's educational system and structure to facilitate the attainment of its educational goals (Adu-Gyamfi, Donkor & Addo, 2016). The researcher posits that, so far as any attempt or plan to introduce an educational reform indeed is a manifestation of a problem in the existing system, a reform should necessarily and ultimately bring about significant improvements and not rather worsen the system or the existing conditions. Otherwise, the reform may not be prudent but a waste of effort, time and resources. This also implies that reform per se is a necessity in the educational front so far as the needs of society changes. Nevertheless, not all educational reforms are desirable, as some do not live their purpose.

Educational reforms started way back in the Gold Coast before the start of colonisation as an attempt to correct inherent problems in the curriculum of the castle schools. The curricula of the castle schools were designed to educate the mulatto and African people to speak, read and write. Governor Rogers in 1908 constituted an education committee to reconsider the educational curriculum based on the teaching of the three Rs of reading, writing and arithmetic in the castle schools (Edusei, 2004). On the contrary, other authors were concerned about the real intentions of the European

education in the country then. They argued that the fundamental aim of the castle school education was to sustain industries back home in Europe (Adu-Gyamfi, Donkor & Addo, 2016). This is because the admission of students into the castle schools betrayed the real intention of the whites. Mulatto children whose education was the responsibility of the whites was the main focus of the castle school education. The other two categories of students admitted into castle schools were the children of chiefs who were the major trading partners locally and the children of rich black merchants whose support must be sought to facilitate trading activities in the Gold Coast. From the two opposing views expressed about the intention of the new castle school curriculum, the researcher rather thinks the real intention of the new castle school curriculum was to serve a dual purpose of teaching the locals/natives the three Rs of reading, writing and arithmetic and for the whites to train their children in the castle schools to sustain their industries back home against the two entrenched opposing views.

Another school of thought had it that the need for the reform in the country's educational system was warranted as far back as 1882 due to the observed inconsistencies in the curricula of castle schools being run by the Portuguese, Dutch, Danes and English (Adu-Gyamfi, Donkor & Addo, 2016). Furthermore, Djamila and Djafri (2011) point to the report of Matiew Arnold, an inspector of elementary schools from 1851 to 1856 in the Gold Coast who criticised the colonial governments' indifference to education. In response, reforms were initiated to address the challenges in the curricula. Governor Gordon Guggisberg was one of the colonial governors in the history of the Gold Coast who was outstanding in forging reforms in education to correct the deficiencies in the existing system. He personally criticised the system as being deficient in both facilities and curricula to prepare the citizens both in technical and vocational training and moral domains (Adu-Gyamfi, Donkor & Addo, 2016).

Education reforms started from pre-colonial era in the Gold Coast but took a more local perspective upon the attainment of the country's independence in 1957. In his final address to the old Legislative Assembly on the 5th of March 1957, the first black president of Ghana, Dr. Kwame Nkrumah outlined his strategies to reform Ghana's education to achieve three goals - using education as a tool for producing scientific literate people to steer the affairs of the economy; removing obstacles in the environment which lead to low productivity; and training the human resource to harness the country's economic potentials (Akyeampong, 2010). In this sense, education was to train the citizens to move away from traditional spiritual worldview to a more systematic and scientific way of solving problems, and to take control of their environment by removing the obstacles inherent in it to achieve the full potentials of our environment.

Anyway, the shortcomings of the curricula were diverse but they could be summarised in the statement that there was the need for a shift in emphasis from purely grammar education to the teaching of "industrial and agricultural" skills (Edusei, 2004, p. 117). Hence, to fine-tune the country's development trajectory, various education committees have been constituted by successive governments of Ghana to restructure the country's education system in order to promote its quality and meet the needs and exigencies of its time. If the curriculum is a product of its time, then reforms are always important to ensure that the curriculum of the day meets the needs and aspirations of the people and able to address the problems and challenges of society. For this reason, curriculum reform is a constant phenomenon in the educational system, as there will always be the need for curriculum change as the needs and aspirations of society change. As a result, there have been several curriculum reforms/changes after independence with the hope that the curriculum of the day reflects the needs of the

country. The fulcrum of educational reform in Ghana is the improvement in the structure, access and quality of education to equip students with employable skills for their proper functioning in the environment (Adu-Gyamfi, Donkor & Addo, 2016). The reforms in Ghana after independence called for successive governments forming a number of educational review/reform committees to make recommendations for major changes in the educational system, structure and curricula.

2.5.1 The Kwapong Committee Educational Review/Reform 1967

The Kwapong reform committee was constituted in 1967, a year after the overthrow of the Nkrumah's CPP government to study the inherent weaknesses in Nkrumah's education policies (Albaugh, 2005; Akyeampong, 2010). According to Akyeampong (2014), upon concluding their studies of Ghana's education system under Nkrumah, the Kwapong committee recommended restructuring the country's education system as follows: ten (10) years elementary education, made up of six (6) years primary education and four (4) years middle school education. Though, the duration for the completion of elementary education was ten years, qualified students were to be admitted into secondary schools midway through their middle school education while those who failed to qualify proceeded to do two-year pre-vocational continuation education to qualify for admission into secondary schools. The committee also recommended seven-year secondary school education - five-year (5) form five and two-year (2) sixth-form secondary school education. This made pre-university education under the structure of the Kwapong Committee seventeen (17) years - 6: 4: 5: 2. There was evidently less emphasis on vocational and technical education in the recommendations of the Kwapong Committee. It is imperative mentioning that this structure of education was not different from what was in operation at independence.

2.5.2 The Dzobo Committee Educational Review/Reform 1973

The Dzobo committee, which was formed in 1970 under the instruction of Col. Ignatius Kutu Acheampong, the President of Ghana and the leader of the National Redemption Council (NRC) recommended in 1973 the restructuring of Ghana's education system (Akyeampong, 2010; Adu-Gyamfi, Donkor & Addo, 2016). Yusif and Yussof (2010) opine that the committee was tasked to look into the structure and quality of education in Ghana. The committee proposed the new concept of the Junior Secondary School (JSS) and Senior Secondary School (SSS) (Yusif & Yussof, 2010). The structure of the proposed education system was six (6) years primary school, three (3) years JSS, three (3) years SSS and four (4) years university (6: 3: 3: 4). This was to replace the 6: 4: 5: 2: 4 existing structure; thus, reducing the duration of pre-university school from 17 years to 12 years (Akyeampong, 2010; Adu-Gyamfi, Donkor & Addo, 2016). As part of the implementation plans/strategies, experimental schools were built in the regional capitals and some selected district capitals to pilot the proposed programme before full-scale nationwide implementation. The old pre-university education structure (6: 4: 5: 2) and curricula continued to run alongside the piloting of the Dzobo committee new proposed educational structure and curricula. According to Yusif and Yussof (2010), the Dzobo educational reform collapsed at the piloting stage and could not be implemented nationwide due to financial difficulties at the time.

The curricula of education of the Dzobo committee reform focussed on the introduction of Tailoring, Woodwork, Catering, Dressmaking, Metalwork, Technical Drawing, Masonry, and Automobile Practice into the new curriculum of basic and secondary schools (Adu-Gyamfi, Donkor & Addo, 2016). The teaching of vocational and technical skills was meant to equip children who could not proceed to the tertiary level, for one reason or the other, the opportunity to engage in paid employment or

found one themselves (Akyeampong, 2010). At this juncture, emphasis of education in Ghana was shifting to preparing the learner to fit into industry.

2.5.3 The Anfom Committee Educational Review/Reform 1987

The Dzobo Committee Reform could not be fully implemented as the old pre-university structure and curricula of education continued to run until it was replaced by the Anfom Educational Committee Reform in 1987. The Anfom Educational Reform Committee was formed in 1986 under the government of the revolutionary Provisional National Defence Council (PNDC) led by Flight Lieutenant Jerry John Rawlings and by 1987 it had finished its work and its recommendations fully implemented by the government. The 1987 reform changed the structure of pre-university education from 17 years to 12 years (6-4-5-2 to 6-3-3) and a curriculum of education focussing more on technical and vocational subjects (Adu-Gyamfi, Donkor & Addo, 2016; Anfom Educational Reform Committee Report, 1987). This means the duration of pre-university education was reduced from the previous 17 years, which was in full operation at the time to 12 years. This new structure of education comprised 6 years of primary education, 3 years of Junior Secondary School, and 3 years of Senior Secondary School education. The six-year primary school, three year JSS and three-year SSS structure fully replaced the old elementary form five and sixth form structure of pre-university school in Ghana in the 1987 reform.

Many educationists continue to hold the perception that the reform by the Anfom Education Committee of 1987 was a repackage of the Dzobo Education Review Committee proposals because of the similarities in the structure and curricula of the work of these two education review/reform committees. Perhaps that is the reason why it took the Anfom Educational Reform Committee only one year to complete its work and the reform becoming operational just one year after its establishment.

The major structural changes also included the three terms within each academic year as well as the Basic Education Certificate Examination (BECE) and the Senior Secondary School Certificate Examination (SSSCE) as requirements for entry into secondary schools and tertiary institutions respectively. The free Compulsory Universal Basic Education (fCUBE) from primary to Junior Secondary School (JSS) was also introduced to help the citizenry attain at least basic level of education to integrate productively into the society.

With respect to curricula change, there were five focus programmes viz Agriculture, General Arts and Science, Business, Technical, and Vocational. As part of the restructuring of education in the country, the National Council for Tertiary Education was set up to oversee the running of tertiary institutions. Their work culminated into the founding of the University for Development Studies (UDS) and the University College of Education, Winneba (UCEW) (Adu-Gyamfi, Donkor & Addo, 2016).

Overall, the focus of the 1987 educational reform by the PNDC government was to redesign the educational system to address vocational and technical problems. The introduction of many technical and vocational programmes attests to this fact. However, the system fails to establish good link between pre-tertiary and tertiary education. As could be observed from the structure, there was no direct connection between pre-tertiary education and tertiary so that students who did the vocational and technical programmes could continue at the highest level to attain professional status in those fields. This did not make the programme attain its ultimate objective of making the education system technical and vocational.

2.5.4 Anamoah-Mensah Educational Review/Reform 2007

In 2002, the President of Ghana, John Agyekum Kufour saw the need to introduce reforms in the education system of Ghana. Hence, he inaugurated an educational review committee under the guidance of Professor Josephus Anamoah-Mensah, the Vice-Chancellor of University of Education, Winneba to reconsider the educational structure and curricula of the country (Adu-Gyamfi, Donkor & Addo, 2016). In terms of system and structure, the most conspicuous alteration introduced by the Anamoah-Mensah committee was the introduction of two-year (2) kindergarten as main stream education and part of basic education and the extension of the duration of secondary school education to four (4) years which was later reversed to three years by a legislative instrument by President J. E. A Mills government/administration in 2009.

In respect of curricula changes, the Anamoah-Mensah committee recommendations focussed on producing well-balanced human resource to promote industrial growth, aligning the educational system to the Ghanaian environment through the promotion of indigenous knowledge, and further shift from grammar-type education to science and technology-based education (Adu-Gyamfi, Donkor & Addo, 2016). It is important to mention that, though only four core subjects – English, Mathematics, Integrated Science and Social Studies were to be taken in the first year of the four-year secondary school programme, the emphasis on technology education necessitated the inclusion of Information Communication Technology (ICT).

On the whole, educational reforms in Ghana have sought to align the educational system to the Ghanaian environment. Hence, the shift in focus from grammar-based education to vocational and technical education has been the focus of all the educational reforms in Ghana. This implies adjustment in structure and curricula to address local challenges in the overall economic development of the country. Lastly,

the inclusion of ICT in the first year of the four-year secondary education programme and also making ICT a compulsory subject taught at the basic level stress the central role ICT plays in the overall set up of the country's development. Technological integration has global coloration to help learners meet the demands of modern industry.

2.6 The ICT Curriculum in Basic and High Schools in Ghana

In order to shift focus from grammar-type schooling to vocational and technical education, Information Communication Technology (ICT) was implemented as a subject both in the basic and second-cycle schools in Ghana (Adu-Gyamfi, Donkor & Addo, 2016) in 2008 based on the recommendations of the 2007 Anamoah-Mensah Educational Reform Committee. For the basic and senior high school level, one major change the reform brought was the introduction of the Information and Communication Technology (ICT) curriculum (Ministry of Education, Youth and Sports [MOEYS], 2004). For its centrality in the educational curriculum, the ICT programme was offered as a core subject at the basic level for all students and offered as core at senior high school level and at the same time as an elective for some students. The emphasis on ICT education is in line with international standard in modern socio-economic development of all world economies. For example, Jingtao, Yuanyuan, and Xiaoling (2010) indicate that, as part of its major steps to keep pace with modern international standard in socioeconomic development, the government of China made ICT education one of the cornerstones of its educational curriculum. The introduction of the ICT programme into the educational curriculum of basic and second-cycle schools through the 2007 educational reform is indeed a step in the right direction because the exigencies of the day require ICT knowledge to function fully. Despite its significance and the consequent introduction to the curriculum of many educational systems globally

including Ghana, if adequate pedagogical support for ICT is not provided in the school for the implementation, the teaching and learning of ICT as well as its use cannot be presumed to be effective to make a meaningful impact.

2.6.1 Rationale and Aims of the Basic School ICT Curriculum

The rationale for introducing the ICT programme into the national educational curriculum of schools is to help develop an Information and Communication Technology culture, knowledge, skills, attitudes, and competencies which are vital for economic development and setting the foundation for higher education in ICT in the 21st century (ICT curriculum, Ministry of Education, Youth and Sports [MOEYS], 2004).

Students at the basic school are expected to be exposed to either ICT theoretical and practical experiences or content. As a result, students are expected to show competency in the use of ICTs as they undergo the ICT programme and the teachers who teach the programme as well are also expected to demonstrate basic competencies in the use of ICTs to perform some basic task. ICT is so important in the world today that it makes it imperative for every young person to be competent in the use of ICTs for the many tasks that one has to do (MoE JHS Syllabus, 2008). The rationale of the basic school (JHS) ICT programme, as documented in the syllabus, is to provide basic skills in Information Communication Technology (ICT) for junior high school students (MoE JHS Syllabus, 2008). The aims of the JHS curricula as stated in the syllabus, are to help the pupil to:

1. acquire basic ICT literacy.
2. develop interest and use ICT in learning other subjects.
3. use the internet effectively for information.

4. follow basic ethics in the use of ICT.
5. acquire keyboarding skills.

At the primary school, the rationale of the ICT curriculum is to predispose primary school pupils to basic skills in Information and Communication Technology (ICT) so as to build the foundation for further learning in the subject as they move into second-cycle education and beyond ((MoE Primary School Syllabus, 2008). The aims of the primary school curricula as stated in the syllabus are to help the pupil to:

1. acquire basic ICT literacy.
2. communicate effectively using ICT.
3. develop interest and acquire skills in the use of the internet.
4. develop basic ethics in the use of ICT.
5. acquire basic mouse and keyboarding skills.

CHAPTER THREE

PEDAGOGICAL SUPPORT FOR ICT AND ICT SELF-EFFICACY IN TEACHING AND LEARNING OF ICT

This chapter presents the second part of the related literature review. The chapter consist of three aspects – conceptual, theoretical and empirical review of pedagogical support for ICT (PSICT) and ICT self-efficacy in teaching and learning of ICT in schools worldwide, including Ghana. The purpose is to help explore and understand the topic by defining and discussing the construct ‘pedagogical support for ICT’ and its components and other fundamental concepts in the topic to highlight gaps in literature and to direct and position the study as well as provide a strong foundation for the study.

3.1 Conceptual Review

The goal of the conceptual literature review is to categorise, define, explain, describe and discuss concepts relevant to the study or topic and outline a relationship between them. It is fundamental in helping to have a deeper understanding of the issues in the topic of study that the research is investigating.

3.1.1 Understanding Pedagogical Support for ICT

To begin with, pedagogy literally means the art and science of teaching particularly, children. It deals mainly with methods of teaching and learning in schools. In the modern context, pedagogy is the term that describes the relationship and interactions between teachers, students and the learning environment and the learning tasks (Murphy, 2008). In modern day usage, pedagogy stands for: A place of instruction; a school, a college, a university; instruction, discipline, training; a system

of introductory training; a means of guidance; The art , occupation, or practice of teaching; also, a theory or principles of education; a method of teaching based on such a theory (Oxford English Dictionary, 2018).

Pedagogical support pertains to guidelines, tools, resources etc. that provide or are oriented to provide support for teaching and instruction. It may include human resources/staff providing services to students to support their instructional programme (Aliaga-Polo, 2022). In this study, the concept of pedagogical support for ICT (PSICT) is operationally defined to pertain to all forms of provisions made available to schools or teachers and students that provide or are oriented to provide support for the teaching and learning of ICT in the school. Principally, this may include ICT infrastructure, such as computers and internet; physical facilities, such as classrooms, tables and chairs; teaching and learning resources/materials such as ICT textbooks, notebooks and writing materials; ICT training, in the form of workshops and seminars, and incentives or motivational packages that support and encourage the teaching and learning of ICT in the school.

According to Arthur (2017), support provided for the teaching and learning of Mathematics influences the teaching and learning of a new mathematical content. Support in general also helps reduce the concerns teachers have, regarding new curriculum implementation and thus, facilitate the implementation (teaching and learning) of the programme (Fullan, 2007), such as the ICT.

3.1.2 ICT infrastructure

The introduction of ICT into the curriculum of schools requires the provision of adequate ICT infrastructure just as Sadegül (2006) opines that the integration of computer technologies into education requires successful development of ICT

infrastructure. Schools' ICT infrastructure and application of ICT have become more visible when examining the development of ICT in education (Chun, Chin-Chung & Di, 2015). ICT infrastructure is a necessary requirement to facilitate the teaching and learning of ICT in schools. According to Moses et al. (2012), it is rooted in literature that ICT infrastructure support can act as a facilitating condition to influence teachers' and students' teaching and learning as well as their use of the technology. ICT infrastructure measures the perceived availability and suitability of ICT tools, such as hardware, software and peripheral equipment provided in the school (Vanderlinde & Van Braak, 2010). It also refers to the availability of equipment, software, internet access and other similar resources in the school (Pelgrum, 2001). According to Obota, Oluoch and Makani (2015), there appears to be a misconception that ICTs generally refer to 'computers and computing related activities'. They assert this is not the case, although computers and their application play a significant role in modern information management. Other technologies and/or systems also comprise the phenomenon that is commonly regarded as ICTs. Pelgrum and Law (2003) state that, towards the end of the 1980s, the term 'computers' was replaced by 'IT' (Information Technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term 'ICT' (Information and Communication Technology) around 1992, when e-mail started to become available to the general public (Pelgrum & Law, 2003). According to a United Nations report (1999), ICTs (ICT infrastructure) cover internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities. According to UNESCO (2002), information and communication technology

(ICT) may be regarded as the combination of 'Informatics technology' with other related, specifically communication, technology. The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counselling, interactive voice response system, audio cassettes, Learning Management Systems (LMS) and CD ROMs have been used in education for different purposes (Sharma, 2003).

ICT equipment (infrastructure) and access provided by the school is a key factor in ICT integration. Access to computer, however, is a problem in many schools (Chun, Chin-Chung & Di, 2015). The limitation of the access to technology is not only for computers but also for projectors, resources and other equipment. It has been found that laptop and tablet computers and mobile phones are increasingly considered as useful in education but access to them is a problem (Prensky, 2001). In the case of Ghana, however, students in basic and senior high schools are not allowed to use mobile phones in the school though research has established its usefulness. School authorities have the mindset that students will use the mobile phone negatively rather than to facilitate their learning.

According to Shiue (2007), teachers will perceive greater control to employ technology into instructional use when they have the necessary hardware and software resources (infrastructure). With ICT infrastructure provided, teachers will be able to access school network, the internet and laptop accessories (Cowie & Jones, 2005). It can, therefore, be argued that availability of ICT infrastructure in a good shape is a recipe to enhancing educators' (teachers') prospects to utilise instructional technology. Past research studies have also shown clearly that ICT infrastructure can be one of the factors that influence the technology use among teachers (Cowie & Jones, 2005; Krysa,

1998; Shiue, 2007). The provision of adequate ICT infrastructure would also be significant to enhance students' learning and their ICT self-efficacy. Thus, the provision of ICT infrastructure can be predicted to have influence on teaching and learning of ICT as well as teachers' and students' ICT self-efficacy in the school.

As recommended by Obota, Oluoch and Makani (2015), the researcher is of the view that, adequate support must be provided for the provision of the whole prerequisite hardware and software infrastructure needs with the supporting elements, such as electricity, maintenance, and technical services in schools. This will facilitate ICT integration, ICT teaching and learning and teachers and students ICT self-efficacy in schools. The basic requirement of this infrastructure, according to Obota, Oluoch and Makani (2015), is the appropriate rooms or buildings to house the technology, electricity and telephony. Obota, Oluoch and Makani, however, observe that low telephone network, computer and access to internet are the main problems of ICT infrastructure in most developing countries. Due to the lack of a network environment and hardware facilities, ICT is not frequently applied in everyday teaching and learning in most classrooms in rural schools in China (Chun, Chin-Chung & Di, 2015). This phenomenon is most likely not to be different in most developing countries including Ghana.

3.1.2.1 Conceptualisation of School ICT Infrastructural Needs

Figure 3.1 conceptualises the main ICT Infrastructure areas that are becoming more relevant to support teaching and learning in general and in particular the ICT programme, as well as assessment and administration in schools.

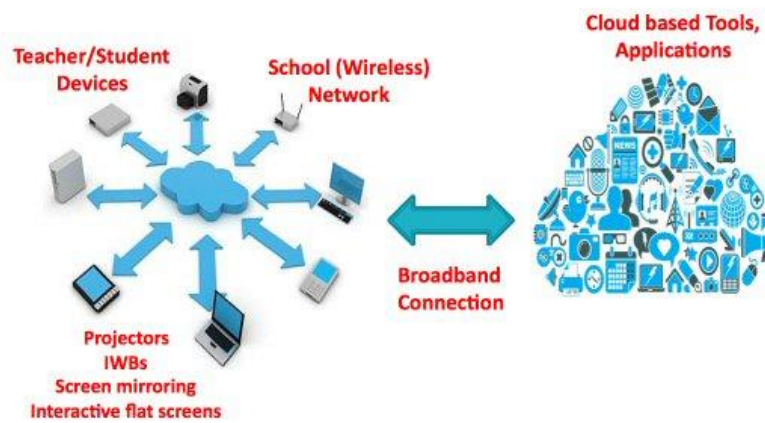


Figure 3.1: Conceptualisation of School ICT Infrastructure Areas

The image highlights some key ICT areas for schools, including school wireless networks, which connect teacher and student mobile devices via broadband to cloud-based tools and applications. While each school is unique in terms of size, location and where they are in terms of using ICT, there are some common shifts and trends that are happening in how schools are using ICT. These include:

1. increased use of cloud-based tools and applications by schools to support teaching and learning. Many are free and provide a diverse and evolving range of possibilities to enhance learning.
2. the importance of fast/reliable broadband to connect with cloud-based applications to access online resources for learning.
3. increasing use of mobile computing devices by teachers and students in the classroom in preference to desktop PCs. Also, tablets are being purchased increasingly in preference to laptops as they provide schools with alternative options to support mobile learning. A shift which is gaining momentum is to allow pupils to bring in their own devices (BYOD) for learning.

4. importance of suitable wi-fi networks within schools to support mobile learning. To support effective learning using mobile devices a 'fit for purpose' wi-fi network is now critical in schools. Wi-fi systems connect mobile devices to online resources via the broadband connection and as such mobile learning, school wi-fi, broadband and use of cloud applications are all inter-dependent. It is important that, if schools are purchasing a wireless network, they seek independent advice.
5. changes in how screens are being mirrored and alternatives to projectors in classrooms. Teachers are using a range of interactive approaches for 'presenting' in classrooms. While interactive whiteboards (IWBs) are still fit for purpose when used effectively, technologies, such as Apple TV or other mirroring approaches, can enable teacher or student screens to be mirrored wirelessly to a large screen. Also, large interactive flat screens (though more expensive to purchase) can provide an alternative to IWBs and/or a projector for new purchases.

3.1.3 ICT Training

The increasing availability of new technologies in an ever-changing digitalised world has gained momentum in all spheres of life (Kerstin & Birgit, 2017), making technology-related skills a key competence not only in professional settings. The effective use of technology is an intricate process that requires time (Baron & Harrari, 2005), equipment, institutional support (Ertmer, 1999) and positive attitudes towards them (Liu, 2006; Zhao, 2005). Besides, it is also important for teachers who assume responsibility for imparting these skills to their students to interiorise their technological skills and move rapidly from low-level technological knowledge to high

level ICT knowledge because their competences in using new technologies constitute an essential prerequisite for the effective teaching of ICT skills in the school (You, 2010). Teachers as well as students appear not to be knowledgeable in the use of ICT because there appears not to be any official training for both the teachers and the students in the schools (Ajayi, Ekundayo, & Haastrup, 2009).

This state of affairs has led to the need for systematic teacher training on ICT in many educational programmes worldwide (Schoepp, 2005; Donnelly, 2010). Teacher professional development, also called continuous professional development/ training in ICT, should be an important focus in the quest to implementing or teaching and learning ICT in school because, according to Kerstin and Birgit (2017), models of school development and school effectiveness found teacher competency and professionalisation to be key elements with regard to student achievement as well as teachers' in-class use of new technology. Indeed, professional development and training is the most important factor in the organisational world today, in that it increases efficiency and effectiveness of employees and the organisation (Raja, Furqan & Khan, 2011). Teacher training and professional development can, therefore, be a major force in enhancing the capacity of teachers to teach new knowledge and skills, especially ICT, to students successfully. Nevertheless, most of the studies focus on prospective teachers' training rather than in-service teachers' training, and few of them evaluate their attitudes towards the usefulness of pre-service ICT training (Sánchez-García, Mena-Marcos, Guanlin, and Escribano (2013) and not their in-service/in-school ICT training.

The quality and level of ICT knowledge ICT teachers and students have can be enhanced if there are support for opportunities for them to participate in ICT training programmes while in the service/school (in-service training/in-school training). It is

perceived that, when teachers and students participate in ICT training programmes, it can have influence on their ability to effectively teach, learn and use ICT in the school. Educational institutions must, therefore, ensure that adequate support is provided to help train and develop teachers to acquire the requisite content and pedagogical knowledge and competencies to enable them teach effectively in the classroom (Sarheng, 2013), especially in new subject implementation or teaching, as in the case of the new ICT programme in the Ghanaian basic school curriculum.

Training is a systematic development of knowledge, skills and behaviour required by employees to perform adequately on confirmed task or job (Shaheen, Naqvi & Khan, 2013). Training is simply learning that is provided in order to improve performance on present job or task (Amin, Rashid, & Lodhi, 2013). Training is closely linked with professional development. Teacher Professional Development is commonly viewed within the realms of school development and school effectiveness (Kerstin & Birgit, 2017) but Hofman and Dijkstra (2010, p. 1031) surmise that 'lifelong learning is at the base of professional development of people in general and this is particularly the case for teachers'. Describing a similar definition of professional development - also called continuous professional development (CPD) - Coldwell, 2017, p. 189) writes:

By professional development (PD) I mean formal and informal support and activities that are designed to help teachers develop as professionals. This includes taught courses and in-school training, as well as activities such as coaching, mentoring, self-study and action research.

It can be inferred from the description of professional development given by Coldwell that professional development essentially requires both pre-service and in-service/in-school training of teachers. While Coldwell (2017) focusses on the professional development of active teachers, it is worth noting that Fraillon et al. (2014)

make a distinction between pre-service and in-service professional development/training. In the context of this research, the focus will be on in-service professional development or continuous professional development/training (in-school training) of the ICT teacher and student. Kerstin and Birgit (2017) made a distinction between internal and external professional development/training: the former involves further training within the school setting (ie. school-based INSET and cluster-based INSET), whereas the latter comprises participation in external training activities (externally-organised training programmes by individuals and organisations such as workshops, seminars, conferences, symposiums, public lectures).

Lack of teacher professional competences, both at didactic and methodological levels, has been found to constitute a hindering factor to the integration of new technologies in class (Drossel, Eickelmann, & Gerick, 2015; Eickelmann, 2011). Banu (2012) also reported that teachers are facing many challenges in introducing ICT into classroom teaching and, in particular, the teaching of ICT due to lack of relevant knowledge and skills. The solution to this could be to integrate the ICT programme into the teacher training programmes in Bangladesh. In this way, the teacher trainees will come out from the training institutions well equipped with the requisite ICT knowledge and skills to teach the ICT programme and as well integrate ICT in teaching of other subjects in the schools. This will mean that in-service training only becomes a supplementary way to build the capacity of teachers in ICT. The professional development/in-service training of teachers in ICT is, thus, recognised as a potential countermeasure to developing ICT teachers' knowledge and skills in ICT, except that, in the estimation of Banu (2012), it must also be emphasised in the pre-service training programmes of the ICT teachers. This observation by Badu about the means to develop

the professional competency of the ICT teacher corroborates Coldwell's (2017) opinion and description of what professional development of a teacher requires.

Teachers who participate in in-service/in-school training or professional development in ICT use computers more frequently in class, put more emphasis on teaching ICT skills and have a stronger sense of ICT self-efficacy (Kerstin & Birgit, 2017). A study about in-service teachers' training in Jerusalem by Angrist and Lavy (2001) revealed that there is significant positive relationship between teachers' training and students' test score or performance in a subject. A similar study entitled, 'Teaching and learning with technology: Effectiveness of ICT integration in schools' by Ghavifekr and Rosdy (2015) also found that professional development training programmes for teachers played a key role in enhancing students learning. Training of teachers is also necessary especially in today's environment of trying to cope with the changing demands of the profession. Training provided to teachers can better position them educate the students as it improves a teacher's knowledge on subject matter and teaching methods of a subject (Pascal et al., 2008).

However, teachers in many developing countries have little or no pre-service preparation before starting to teach and may not have the opportunity and support to participate in in-service/in-school training programmes or in-service professional development activities (Campbell & Smith 1997; Johnson et al., 1998; McKeachie 1999). Similarly, students in school hardly get the opportunity and support to participate in training programmes to complement and extend what they learn in the classroom. But offering students in the school such opportunities and supporting them to participate in subject-related training programmes or activities can be very beneficial to the students. The goal of pre-service and in-service training and professional development for teachers is to ensure that they become more capable, effective and

efficient in performing their teaching functions. Students' participation in training programmes can also help add to their knowledge repository. There is, therefore, the need to provide systematic ICT in-service training opportunities and support ICT teachers to participate to help them acquire, upgrade and update their ICT content and pedagogical knowledge and skills while in the school. Similarly, students should be offered the needed support to participate in in-school training opportunities to help complement and extend their classroom knowledge of ICT. This way, the teaching and learning of ICT most likely will be enhanced, as in-service/in-school training is designed to fill the gap of professional inadequacies of a serving teacher (Osamwonyi, 2016) and can also fill classroom learning gap of students. In designing ICT courses, however, great attention should be paid to improving students' abilities in using ICT technologies and adapting to the ICT learning environment (Chun, Chin-Chung & Di, 2015).

3.1.3.1 Conceptualisation of ICT Training Avenues

Figure 2.3 conceptualises the main avenues or sources of receiving ICT training. The figure postulates that there are two main avenues to receiving ICT training – pre-service and in-service/in-school. Pre-service ICT training is received through a teacher training programme/ curriculum. In-service/in-school ICT training is received through both school-based (SB) and cluster-based (CB) INSET and also through participating in externally-organised ICT training programmes in the form of workshop, seminar, conference, symposia, and public lecture. However, of significant interest to the researcher is the participation of teachers and students in externally-organised in-service/in-school ICT training programmes in the form of workshops, seminars,

conferences, symposia, and public lectures to acquire, update and upgrade their ICT knowledge and skills or extend their ICT learning.

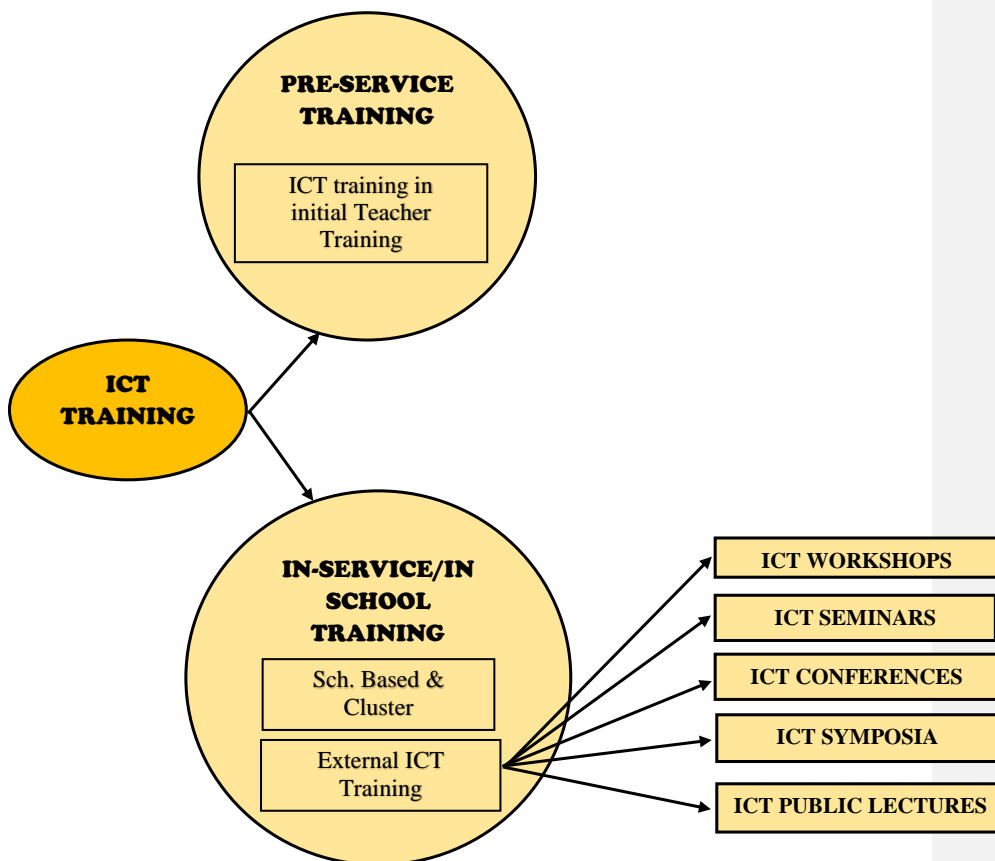


Figure 3.2: Conceptualisation of source of receiving ICT training

3.1.4 Teaching and Learning Resources and Facilities

The education system in many developing countries is faced with a number of shortcomings including inadequate teaching and learning resources in basic and

secondary schools due to poor planning and corruption (Yara & Oteno, 2010). Availability of teaching and learning resources enhances the effectiveness of schools by improving teaching, learning and academic performance (Maicibi, 2003). A study by Yara and Oteno (2010) indicated that availability of teaching and learning facilities and resources, such as classrooms, textbooks, syllabus, notebooks and writing materials, have positive and significant effect on teaching and academic performance in Mathematics. A study by Okongo, Ngao, Rop and Nyongesa (2015) also revealed that there were inadequate teaching and learning resources at the pre-school centres in Nyamira County, Kenya. According to DFID (2007), adequacy of instructional materials, such as textbooks, which is the main instructional material, is the most effective input affecting students' performance.

A study by Acquah (2012) on the state of implementation of ICT as a course at the basic level schools in Ghana asserts that ICT textbooks, computers and other peripheral ICT facilities/resources needed for effective implementation of ICT subject in Ghanaian basic schools were woefully inadequate. Similarly, most of the basic schools in the Sekondi-Takoradi of Ghana do not have stable internet connection for use by teachers and students. Other ICT resources such as digital cameras, overhead projectors, whiteboards, tablets, scanners and photocopiers were badly lacking (Quaicoe & Pata, 2015).

For effective teaching and learning of any subject, course or programme, textbooks and resource materials are basic tools, and their absence or inadequacy makes teachers handle subjects in an abstract manner, portraying it dry and non-exciting (Okongo et al., 2015). Scarcity of subject textbooks, libraries, tables and chairs, classrooms and other physical facilities, therefore, affect the teaching and learning of a subject (Combs, 1970). Adeogun (2001) discovered a very strong positive significant

relationship between availability of teaching and learning resources and academic performance in a subject. In a study to assess availability of support for ICT teaching and learning, therefore, it becomes imperative to consider the provision and supply of the needed ICT teaching and learning resources and facilities in schools.

3.1.5 Incentive/Motivation

No one can under-estimate the concept and importance of motivation and the role it plays in achieving individual and organisational objectives in the pursuit of any activity or goal. That is why managers and stakeholders of institutions and organisations usually institute motivational strategies aimed at making workers/people give off their best. Such motivational strategies include: praise, thank you, recognition, best worker awards, promotions, study leave, allowances, good salaries, and better conditions of services (Kenney, 2014). Principal motivational strategies in school systems, such as monetary incentive, a conducive environment, non-monetary incentives, conditions of service, recognition, regular and attractive payment of salary and effective communication, are very significant in ensuring the productivity of teachers in the school (Republic of Kenya/UNESCO, 2012). These motivational packages, when in place, push teachers and students to give off their best for the achievement of their teaching and learning goals (Kenney, 2014).

Incentive is an act or promise for greater action. Incentive is something which is given in addition to wages. It means additional remuneration or benefit to an employee or a person in recognition of achievement or to induce him to work better. Apart from monetary incentive, job/task satisfaction, job security, and promotion can be other stimulus packages which can drive a person to work better (Orodho, 2013; Orodho, Waweru & Thinguri, 2013). A combination of financial and non-financial

incentives helps in bringing motivation and zeal to work in ways that really enhance the productivity of teachers in the school system (Mumanyire, 2005).

Everyone who participates in an activity does so for a reason, the question of why people do what they do and what drives their behaviour has its answer in motivation (Arthur, 2017). Motivation is to inspire people to work in ways to produce best results (Orodho, 2013). According to Kreitner and Kinicki (1998), the word 'motivation' is derived from the Latin word 'movere' which means 'to move'. They contend that motivation is the psychological processes that cause arousal, direction, and persistence of voluntary actions that are goal-directed. Motivation is the processes or factors that cause people to act or behave in certain ways (International Dictionary of Management, 1990). Motivation is the act of inducing a person to do something. It is the driving force behind every activity (Turkson, 2007). According to Mullins, our performance at work or any activity is influenced by motivation and ability (cited in Turkson, 2007).

Motivation refers to the forces that maintain and alter direction, quality and intensity of behaviour (Archer & Adentwi, 2008). They further maintain that motivation is the process of influencing or stimulating a person to take actions that will accomplish desired goals. As cited in Archer and Adentwi, Cole (1995) defines motivation as, 'those processes, both instinctive and rational, by which people seek to satisfy the basic drives, perceived needs and personal goals, which trigger human behaviour' (p.119). Mitchell (1982) contends that motivation is the degree to which an individual wants and chooses to engage in certain specific behaviours. Motivation is to inspire people to work in ways to produce best results (Orodho, 2013). According to Mullins (2007) a fuller definition of motivation is given by the Chartered Management Institute as the creation of stimuli, incentives, and working environments conducive to enable people

to perform to the best of their ability. In this study, motivation is used interchangeably with incentive to refer to anything that drives, stimulates, and pushes an individual to want to engage in an activity or goal-oriented behaviour.

Psychologists have proposed several ways of thinking about motivation. One of such ways is looking at whether motivation arises from outside (extrinsic) or inside (intrinsic) (Siann, Lightbody, Stocks, & Walsh, 1996; Walsh, 2005).

3.1.5.1 Intrinsic Motivation

Many authors in educational psychology have worked on intrinsic motivation. The study by Bargh, Gollwitzer, and Oettingen, (2010) explains the concept of intrinsic motivation as a drive that stimulates the individual to adhere to changes or perhaps adopt some behavioural changes that will be beneficial to their internal fulfilment and satisfaction. The self-applied nature of intrinsic motivation is known to have direct connectivity between the individual and his interest. In the design of all learning programmes, such as ICT, intrinsic motivation is a very important factor, since it reflects the desire to do something. Studies postulate that, if a student is internally motivated, then external motivation may not appear and yet the work (learning) will be done (Latham, 2004). Thus, when students are intrinsically motivated, the enjoyment they experience is sufficient for them to perform the activities in future. The study by Williams & DeSteno (2008) further explain it to be undertaking of an activity as a hobby without external incentives and personal satisfaction is driven by self-initiated achievement. These authors expand that, in terms of performance, students with high intrinsic motivation are bound to perform better in classroom activities since they are willing and eager to learn new things, in this case the ICT programme. The student who is motivated intrinsically finds learning of ICT as a nice experience which is more

Commented [WU1]: Not clear.

meaningful and delves deeper for full understanding. That is where a student will work on an ICT task because it is enjoyable and not because there exists a reward such as a prize, a payment or a good grade (Bargh, Gollwitzer, & Oettingen, 2010).

Contrarily to other views, Walsh (2005) explains that intrinsic motivation does not imply a person does not seek for reward. Thus, beyond internal motivation, external motivation is critical in keeping individuals motivated. A person who is intrinsically motivated may still seek extrinsic reward. The renowned theorist, Abraham Maslow, has clarified that there are conditions that need to be satisfied before we can be intrinsically motivated, and these conditions include the satisfaction of the basic human needs. By the theory (Maslow, 1955, 1965), there exist five basic levels of human needs.

The first among these needs is the physiological needs. People are motivated to satisfy a need that ensures physical survival. These needs may include food, water, air, shelter, clothing and sex. As people get satisfied with these needs, they proceed to concentrate on higher level of needs. The second to the physiological needs is the safety needs. With this type of needs, once the need of physiology is met, our attention and concentration is brought to safety and security of our lives. These safety and security needs include order, stability, routine, familiarity, control over one's life and environment, and health. When the physiological and safety needs are satisfied, the third need, called the social need or love and belonging need, is ushered in. The love and belonging needs include love, affection, belonging and acceptance. These needs usually exist in relationship with others, and people are mostly motivated for these needs by the love from families. At the end of the first three needs, the fourth need of esteem needs is roped in. This is where people find the need for stability firmly based, usually evaluating themselves for self-respect or self-esteem and for the esteem of

others. The self-esteem needs are classified into two categories. The first category includes the desire for strength, achievement and adequacy, mastery of competence, confidence, independence and freedom. The second category includes the desire for reputation and prestige where they command respect from other people (status, fame, glory, dominance, importance, recognition, dignity and appreciation). The final of the needs of men, as indicated by Maslow, is the need for self-actualisation. This level of hierarchy is concentrated on the individual ability to reach their full potential in life. The fifth need can only be concentrated upon when we have satisfied the first four. It is by then that we can concentrate to function to our full potential.

The first four needs are called the deficiency needs, according to Maslow. This is because they come from things we lack in life and can only be met by external sources, be it the environment, the people or the things surrounding us, while the need of self-actualisation is a growth need. The self-actualisation need provides the needed room to grow and develop as an individual. This is a need always motivated intrinsically because it is as a result of pure enjoyment and desire to grow. Although the originator of the theory accepts that self-actualisation is rarely achievable, even in adults, it is worth noting that teachers must make sure students' deficiency needs are satisfied in order to move on to their growth. Intrinsic motivation will not occur until they are well-fed, safe in their environment, and can love and respect the teachers and their classmates in a reciprocal gesture. From there on, intrinsic motivation will be a breeze. Maslow's Hierarchy of Needs tells us that an individual will not be motivated to strive for higher-level goals, such as education, until lower-level needs have been met (Maslow, 1970b). Applications of Maslow's hierarchy theory to student's cognitive needs mean that students can be only intrinsically motivated if and only if their basic physiological needs are met, first. For example, a tired and hungry student will find it difficult to focus on

learning. Students need to feel emotionally and physically safe and accepted within the classroom to progress and reach their full potential. Maslow suggests students must be shown that they are valued and respected in the classroom and the teacher should create a supportive environment. Students with a low self-esteem will not progress academically at an optimum rate until their self-esteem is strengthened.

3.1.5.2 Extrinsic Motivation

The second aspect of motivation is the extrinsic motivation. It generally refers to any form of motivation, apart from intrinsic motivation. The extrinsic motivation refers to factors that are outside or external rewards, which may include money or grade for students. These rewards provide satisfaction and pleasure that the task itself may not provide. The study by Huitt and Dawson (2011) contends that an extrinsically-motivated person will work on a task when there is no or little interest because of the anticipated satisfaction they will get from the reward. Extrinsic rewards for students are tangible rewards given by teachers to students to motivate them and reinforce performance and behaviour. They are extrinsic because they come from outside the student rather than inside (Fredrickson, 2009). According to Fredrickson, students who are extrinsically motivated may not enjoy certain activities, because they will only engage in activities for which they can receive some external reward. Walsh (2005) explained that extrinsic motivation does not mean that a person will not get any pleasure from working on the activity. It just means that the pleasure they anticipate from some external reward will continue to be the motivator even when the task to be done holds little or no interest.

Educational psychology has shown that abuse of extrinsic motivation in the form of praise and reward may cause resentment, limitation of transfer, dependency on

teachers and will undermine intrinsic motivation. They suggested that, to limit the negative effects of extrinsic rewards, teachers should use extrinsic forms of reward only when correct or desired responses occur. Motivation drawn from extrinsic factors is more likely to create behaviour changes and can involve little to no preparation or effort to produce effective results. Applying this type of motivation also requires little or no knowledge of students interests (Riedl & Stern, 2006; Schunk, 2005; Schunk & Zimmerman, 2007).

A combination of financial and non-financial incentives helps in bringing motivation and zeal to work in ways that really enhance the productivity of teachers and students in the school system (Mumanyire, 2005). A motivated ICT teacher will offer his best in terms of achieving the expected goals in the school system (Orodho, 2013; Sava & Orodho, 2014) and that of the student. Getange (2016) found that teacher incentives or motivation has significant influence on their teaching output or productivity. It is right to assume that, since motivation enables teachers to teach more effectively, ICT students most likely require motivation to learn the ICT subject more effectively in the school. This is because learning is found to have direct relationship with teaching.

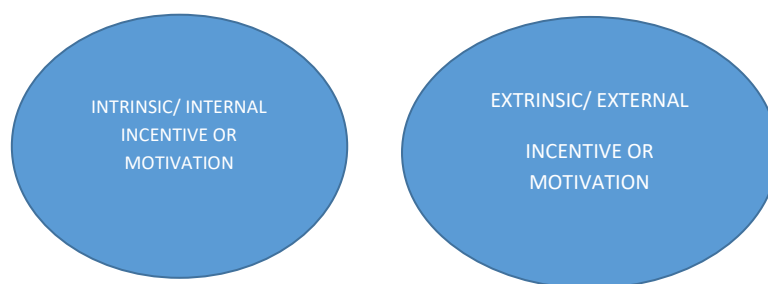


Figure 3.3: Conceptualisation of source of incentive/motivation for ICT teaching and learning

3.1.6 Exploring the Concepts of Teaching and Learning and their Relationship

Teaching and learning is a fundamental concept primarily associated with education, particularly formal education. Teaching and learning is one of the two dependent variables that the study intends assessing; hence, the need to extensively explore the concept to establish its relationship with pedagogical support for ICT (PSICT) and fully appreciate the context in which it is used.

3.1.6.1 The Concept of Teaching

Various definitions and interpretations have been given to teaching. According to Nilsen and Albertalli (2002), teaching in its broadest sense is the process whereby a teacher guides a learner or a group of learners to a higher level of knowledge or skills. Desforges (1995) defines teaching as the management of pupils' experience, largely in classrooms with the deliberate intention or purpose of promoting their learning. Teaching is an art of inducing students to behave in ways that are assumed to lead to learning, including an attempt to induce students to so behave (Schlechty, 2004). What Schlechty meant by teaching being 'an art' is that the teacher must create situations to facilitate learning and then motivate learners to have interest in what is being transmitted to them. In a similar view, Melby (1994) stresses that teaching is not merely dispensing subject or lesson having but an art which involves the student in the teaching-learning process where the student is given the chance to participate fully in the process – that the teacher accepts each pupil and has a favourable attitude towards individual differences.

It is a relationship in which the teacher eschews sarcastic statements, ridicule and fault-finding. Teaching is getting at the heart and mind so that the learner values learning and to believe that learning is possible in his/her own case and not mere

pouring out knowledge or hearing lessons (Thring, 2001). Frimpong (1990) defined teaching as the process whereby a teacher imparts knowledge, skills, attitudes and values to a learner or group of learners in a way that respects the intellectual integrity and capacity of the learners with the aim of changing the behaviour of the learner(s). From this definition, one can say that teaching involves not only how information from the teacher gets to the learner but also how the learner (i) uses it, (ii) interacts with it, (iii) receives guidance and (iv) receives feedback.

Smith (2004) sees teaching as the process of carrying out activities that experience has shown to be effective in getting students to learn. He goes on to say that teaching is that which results in learning – learning is the responsibility of the teacher and that if students do not learn, it is the fault of the teacher. He capped his statements on teaching by stating that teaching is undertaking certain ethical tasks or activities, the intention of which is to induce learning. Teaching is intimate contact between a more mature personality and a less mature one which is designed to further the education of the latter (Morrison, 1934). In the view of Smith (1963), teaching is a system of actions intended to induce learning. According to Gage (1963), teaching is a form of interpersonal influence aimed at changing the behaviour potential of another person. Amidon (1967) also interpreted the concept of teaching as an interactive process, primarily involving classroom talk which takes place between teacher and pupil, and occurs during certain definable activities. Davis, Norris, and Kratzer (1962), Gagne, Saint-Dizier, and Picard (1974) and Gage (1978) have contributed significantly to defining this concept, and their views could be summarised as follows: Teaching is a scientific process, and its major components are content, communication and feedback. Farrant (1980) simply defined teaching as a process that facilitates learning. Confucius, cited in Knott and Mutunga, said ‘in his teaching, the wise man guides his students but

does not pull them along; he urges them to go forward and does not suppress them; he opens the way but does not take them to the place. If his students are encouraged to think for themselves, we may call the man a good teacher' (1993:158). This quote which places the ultimate responsibility of learning on the learner, is in sharp contrast with Smith (2004) who places the responsibility of the student learning on the teacher.

From the above definitions on teaching, it can be deduced that two main views of institutionalised teaching can be pointed out; that is, formal teaching in which the teacher directs the teaching-learning process with minimal student participation and informal teaching in which the teacher serves as a guide, facilitator, counsellor or motivator, and student participation is very high in the teaching and learning process. While the former reflects traditional view of teaching, the latter reflects modern thinking of what teaching should be. It is also instructive to mention that the modern philosophy about teaching is more student-centred, while the traditional philosophy about teaching is more teacher-centred.

In exploring the concept of teaching, Ababio (2013) identified three phases of teaching as: Planning Phase (Pre-teaching Phase); Implementation Phase (Teaching Phase), and Evaluation Phase (Post-Teaching Phase). He explained that the three phases are the decisions that a teacher has to take on a daily basis regarding how to plan for his/her lessons and basically cover issues such as what to teach, how to teach what has been selected and how to evaluate what has been taught.

In a similar view, there are certain characteristics given by Shulman (1987) that every professionally-trained teacher should possess for purposes of teaching. These include content knowledge, general pedagogical knowledge, curriculum knowledge, knowledge of learners and their characteristics, knowledge of educational

context/human relations, pedagogical content knowledge/teacher craft knowledge and knowledge of educational ends.

Discussions on the concept of teaching can be endless and, like many other concepts in education, difficult to reach consensus on one single precise definition. Thus, teaching defies a single definition. How one defines teaching, however, most likely would influence his or her approach to teaching (how he/she teaches or does) in the classroom. Despite the different definitions and interpretations, the researcher is of the view that teaching should be seen as a means to an end and not an end in itself. That is to say that we do not teach for the sake of teaching but with the ultimate intention of inducing or promoting learning. The only reason teaching is necessary is learning. Learning, therefore, is the only evidence and product of teaching. The researcher, in contributing to the ongoing discussion, views teaching in the context of formal education as the planned process by which a more-informed individual (teacher) creates the necessary environment for learning and assists the less-informed individual (student/learner) to gain or experience new knowledge, skills, attitudes and values, thereby bringing the learner to the point of known from the point of unknown.

3.1.6.2 The Concept of Learning

Learning has been defined by educational psychologists in different ways and meanings. It has been explained as a quantitative increase in knowledge, memorising of facts, skills, and methods that can be retained and used as necessary. It is also viewed as making sense or extracting meaning, relating parts of the subject matter to each other and to the real world, interpreting and understanding reality and comprehending the world by reinterpreting knowledge (Behlol & Dad, 2010). According to Thorndike (1928), learning is a permanent change in behaviour as a result of experience, and the

behaviour includes both of the external and internal actions of the individual which are observed and remain unobserved by the outside world. It also includes the different ways in which people understand or experience or conceptualise the world around them. In the view of Brockett and Roger (1994), learning is a personal act of an individual to make full use of his potential. It is a process of self-actualisation to its maximum level. Learning is a process of continuous change in human performance or performance potential (Driscoll, 2000). It must come about as a result of the learner's experience and interaction with the world around him. For Vaill (1996), learning is a way of being. It is an ongoing set of attitudes/temperaments and actions by the individual and groups which they employ to keep abreast of the surprising, novel/new, ambiguous, obtrusive and recurring events.

There are theories that explain how learning takes place. Behaviourism is a perspective on learning that focusses on changes in individuals' observable behaviours. Constructivism, which is another perspective on learning, focusses on how students actively create (or 'construct') knowledge out of experiences. Irrespective of the definition or the theory that explains learning, the researcher is of the view that learning is both a behavioural and a cognitive process that results in the acquisition of and demonstration of new knowledge, ideas, skills, attitudes and values that make an individual more informed, resourceful, capable, functional and useful than before.

3.1.6.3 Teaching and Learning Relationship

From the foregoing discussions on the concepts of teaching and learning, we can infer that teaching and learning are intricately linked together, like Siamese twins. The major goal of teaching is for the teacher to ensure that students/pupils learn what has been taught. It, therefore, behooves the teacher to teach in such a way as to promote

learning (Ababio, 2013), in that teaching strategy has a positive effect on student learning (Isola, 2019). Against this backdrop, teachers should note that the purpose of teaching is not the time for them to air their knowledge but to help children to learn (Colin, 1969). While teaching is an important antecedent for learning, it is worth mentioning that learning is possible without teaching. Thus, a teacher necessarily needs student(s) for purposes of teaching but student(s) do not necessarily need a teacher for purposes of learning. However, the effectiveness of student(s)' learning can be influenced by the effectiveness of teacher(s)' teaching (teaching method/pedagogical strategy), and several factors, including appropriate support also influence a teacher's pedagogical strategy. This explains why students' academic success or failure is usually blamed on the teacher(s). The effectiveness of teaching and learning of subjects in the school, for instance, the ICT curriculum, can be influenced by several factors. In the context of this study, however, one of the principal objectives of the research is to examine the influence of pedagogical support for ICT (PSICT) on teaching and learning of ICT (TLICT) in the basic school.

3.1.7 Self-Efficacy

The concept of self-efficacy becomes an important issue to discuss when assessing pedagogical support for ICT influence on teaching and learning of ICT and teachers' and students' ICT self-efficacy in the school, because the mere teaching and learning of the subject in the school does not guarantee effective use of ICT by teachers and students. In fact, there can exist a vast difference between ICT teaching and learning, and actual practice or use of ICT tools/resources by teachers and students to accomplishing tasks. It is imperative, therefore, to assess the self-efficacy of teachers'

and students' ICT use in the school and further examine the influence of pedagogical support for ICT on their ICT self-efficacy.

The literatures have underscored the self-efficacy of teachers and students as an important variable in the successful use of ICT in task accomplishment (Şendurur, 2012). Self-efficacy, as known, is one's current perception of efficiency commonly defined as a person's belief about his/her capabilities to achieve a goal or an outcome. According to Bandura, self-efficacy is an individual's perception of his competencies, which plays a significant role in his ambition and outcome expectation. Bandura's self-efficacy theory suggests that a person's confidence in his abilities can determine his drive and decisions.

Self-efficacy is individualistic or a personal expectation or judgment concerning one's competence to accomplish some task (Renner, Kwon, Yang, Paik, & Kim, 2008). It has been defined as the person's decision of his capabilities needed for organisation and execution of an action needed to achieve a designated task (Luszczynska & Gutiérrez-Doña, 2005). Used contextually, it emphasises the personal abilities and perceptions of students and teachers as determiners of technology integration (Kirana et al., 2018). Teachers' ICT self-efficacy is their perceived ability to use the computer and ICT resources in teaching and in performing other tasks (Teo & Koh, 2010); that is, the teachers' perception of their ability to perform the tasks necessary for successful ICT integration (Kiran, Zaman, Naz, 2017). Self-efficacy can, thus, be regarded as an 'effective motive', which implies a person's self-confidence about the possibility of himself for herself successfully completing a particular task. In the work of McShane and Von Glinow (2015) self-efficacy relates to one's perception and belief that they have what it takes to execute a task which leads to a successful accomplishment of a goal. Thus, self-efficacy is the 'can do' attitude to accomplishing a task, which leads to

the attainment of set goals. By implication, self-efficacy is subjective, as one could think they could accomplish something but they soon find out that they could not. This notwithstanding, it is a positive sign to accomplishing a task, since it is a pointer to the person's level of confidence, which is a pre-requisite to goal attainment. Self-efficacy could, thus, be seen as a driver which predicts one's technology usage (Teo & Koh, 2010).

People who are with a strong sense of self-efficacy mostly take up difficult tasks that are challenging, and these people are mostly motivated intrinsically. A person with high self-efficacy mostly recovers quickly and does not become a victim of setbacks, and is mostly likely to achieve his personal goals. On the other hand, a person with low self-efficacy is believed not to make initiative for self-determination. Since he is less determined, he mostly considers challenging tasks as threats needed to be avoided instead of opportunities. This has resulted in people with low self-efficacy being pessimistic with little aspiration, which may result in disappointing task results as part of the self-fulfilling feedback cycle (Gutiérrez-Doña, Lippke, & Renner, 2009).

The student's or teacher's level of self-efficacy plays an important role in their learning and use of ICT in the school. The study by Schunk (1991) suggests that there is a relationship between self-efficacy and student academic performance. Thus, self-efficacy predicts academic achievement. According to him, self-efficacy influences the amount of effort and persistence devoted by a person to accomplish a task. In any learning situation, students enter with a sense of efficacy that is based on their aptitudes and past experiences in similar tasks. Students' self-efficacy influences what they do, how hard they try, and how long they persist; that is what Schunk calls 'task engagement variables'. Throughout the learning episode, the students seek efficacy cues, signalling how well they are capable of doing the task. They use these efficacy

cues to establish their self-efficacy for similar tasks in future. This analogy can be directly applied or related to students and teachers' ICT use in the school. According to Schunk (1991), motivation can be enhanced when people (teachers and students) have perception that they are progressing in a given task; in this case, the use of ICT in performing a task. As teachers and students become more skilful in performing a task, they maintain their level of self-efficacy for performing well (Arthur, 2017). In this study, the ICT self-efficacy of teachers and students, regarding their ICT use, is assessed, and the influence of pedagogical support for ICT on their self-efficacy of ICT use examined. The researcher also assumes that teachers' and students' ICT self-efficacy (TSICTSE) mediates the relationship between pedagogical support for ICT (PSICT) and teaching and learning of ICT (TLICT). Thus, while teaching and learning of ICT can be directly improved or made effective by improving pedagogical support for ICT, the teaching and learning of ICT can also be indirectly improved or made effective by improving teachers' and students' ICT self-efficacy in school. Based on this assumption, mediation analysis was also carried out.

3.1.8 Development of Construct Measurement Scale

Developing a measurement scale that is valid and reliable is always challenging (Mishra, Sharma, Singh & Thakur, 2016). Scale development is a process of developing a reliable and valid measure of a construct in order to assess an attribute of interest. Industrial-organisational research involves the measurement of organisational and psychological constructs, which present unique challenges because they are generally unobservable (e.g., work attitudes, perceptions, personality traits). As opposed to observable characteristics, for instance, height, precipitation and velocity, unobservable constructs cannot be measured directly and must be assessed through indirect means,

such as self-report (Tay & Jebb, 2017). Unobservable constructs are often very abstract, making it very difficult to determine which items adequately represents them – and which ones do so reliably. Again, unobservable constructs are often complex and may be composed of several different components/dimensions rather than being a single, solitary concept. According to Tay and Jebb (2017), the complexities associated with developing a measurement instrument can be a challenging task, and validation is especially important to the process of scale construction.

Scale creation can be approached deductively or inductively. The deductive approach, which focusses on using theory and already-formed conceptualisation of construct to generate items within its domain, is useful when the definition of the construct is known and substantial enough to generate an initial pool of items. When there is uncertainty in the definition or dimensionality of the construct, the inductive approach becomes useful. What is done in this case is that organisational incumbents are asked to provide a description of the concept, and a conceptualisation is then derived, which then forms the basis for generating items (Tay & Jebb, 2017).

According to Tay and Jebb (2017), regardless of the approach to scale creation, in order to create a scale, a clear conceptualisation of the construct is required. This entails delineating and defining the construct to carefully and clearly set the boundary right (by stating what it is, and what it is not) either through a thorough literature review or through an inductive uncovering of the phenomenon. A broad construct requires different types of items than one that is more specific. It is also important theoretically to specify the likely number of components or dimensions that make up the construct.

A key issue or idea in construct definition is to outline the nomological network; that is, specifying or stating what the construct should be positively related to, negatively related to, and relatively independent of, based on theory. The nomological

network will be essential to the validation process, as a scale that empirically relates to other established measures in the way predicted by theory displays important types of validity evidence (convergent and divergent validity). Experts recommend that, before writing items for a scale, it is necessary to specify the purpose of the scale. For instance, will the scale be used for research, selection, development, or another purpose?

Scale item writing should be guided by certain principles. In the first place, when writing items, one aims to create an initial item pool that contains many more items than in the final scale (eg., 3 – 4 times larger than in the final scale). This gives the researcher more freedom about the psychometric standard of items that survive to the final scale. The initial redundancy and over-inclusivity in the initial item pool is also desirable because it can serve to uncover sub-dimensions or closely-related but distinct constructs. Again, the writing of the items should be simple and straightforward; one should avoid slang, jargon, double negatives, ambiguous words, overly abstract words, and favour the use of specific and concrete words; no double-barrelled items; no leading questions or statements; and items should not be identical re-statements but should seek to state the same idea in different ways. Finally, it is often helpful to provide the construct definition, relevant adjectives, and example of scale items to item writers when generating items (Tay & Jebb, 2017).

Validation is supremely important in the development of a self-report scale. This is because, in the measurement of unobservable variables, one cannot simply assume that a scale measures what it intends to. Cronbach and Meehl (1955) have suggested many ways or approaches to scale validation. These includes comparing group differences, assessing correlations with other measures or examining the change in scale scores over repeated occasions. The approach of establishing correlation with

related constructs/criteria are particularly important for assessing convergent-divergent validity and predictive validity.

Regarding sampling, the preliminary sample size for examining psychometric properties of items has been recommended to be 100-200 and a later confirmatory sample size of a minimum of 300. However, this may depend on group differences and the type of analysis one seeks to conduct. Based on its theoretical and practical context, one should also seek to match the validation of the scale to its application. After data collection, one needs to establish the reliability and validity of the scale items. At the first step, it is critical to identify a good set of items with reasonable psychometric properties. This is usually done by examining the mean, standard deviations, score range, endorsement proportions across all the options, and the item-total correlation for each item. One should select items that have reasonable item-total correlation (around .20 or higher), appropriate score ranges (i.e., no ceiling or floor effects), and a utilisation of different scale options. Based on the selected items, the reliability is calculated. The internal consistency is the most common approach used to calculate reliability. In general, the rule of thumb for internal consistency is a minimum of .70 (Tay & Jebb, 2017; Cronbach's Alpha, 1990).

It is important to distinguish reliability from dimensionality, as a high reliability does not necessarily indicate unidimensionality. The number of dimensions should have been specified by theory and be confirmed by exploratory factor analysis (EFA). EFA loadings of items to specified dimensions should be moderate (.4 or 40%) to high (closer to 1.0), and one may choose to delete items that are inappropriately low on other dimensions or have low loadings. After theoretically-based dimensionality is born out in EFA, confirmatory factor analysis (CFA) should be conducted to see if the results will indicate the scale construct can explain its variance (Burton & Mazerolle, 2011).

The construct-based validity explains whether the items are measuring what they should measure. Multiple indices are used to evaluate the model fit. The common model fit indices often used are the comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardised root mean square residual (SRMR) (Kline, 2011). General standards hold that the minimum standards of good fit for these metrics are: CFI $\geq .90$, TLI $\geq .90$, RMSEA $\leq .08$, SRMR $\leq .08$ (Kline, 2013) and CFI $\geq .95$, RMSEA $\leq .08$, SRMR $\leq .08$ (Fornell & Lacker, 1981). It is recommended that each subscale (factor) includes at least three items in order to capture the true central of each dimension (Carpenter, 2018). Methodologists recommend being over-inclusive with the number of items (Clark & Waston, 1995; Kline, 2013; Loewinger, 1957).

3.1.9 Overview of the Pedagogical Support for ICT (PSICT) and Teaching and Learning of ICT (TLICT) Measurement Scales

Theoretical propositions consist of relationships between abstract constructs. Testing theoretical propositions requires measuring these constructs accurately, correctly, and in a scientific manner, before the strength of their relationship can be tested. Measurement refers to careful, deliberate observation of the real world and is the essence of empirical research. Constructs are broad concepts or topics for a study. Constructs can be conceptually defined, in that they have meaning in theoretical terms. In the context of survey research, a construct is the abstract idea, underlying theme or subject matter that one wishes to measure using survey questions. Some constructs are relatively simple and can be measured using only one or a few questions, while other constructs are more complex and may require a whole battery of questions to fully operationalise the construct to suit the end user's needs. Complex constructs contain

multiple dimensions or facets that are bound together by some commonality that, as a whole, composes the construct. Without clearly conceptualising the construct's dimensions and the common theme binding the dimensions together, the survey developer runs the risk of creating a set of questions or items that does not fully define, relate or measure the construct.

Measurement of a construct, therefore, requires conceptualisation and creating measures of such construct(s). In this study, an attempt is made to conceptualise the constructs 'Pedagogical Support for ICT (*PSICT*) as well as 'Teaching and Learning of ICT Teaching (*TLICT*)' and develop their constituent components (dimensions), which can be used as model measures for their full assessment or measurement (see Figure 3.5).

Conceptualisation is the mental process by which concepts and their constituent components are defined in concrete and precise terms. The process of regarding constructs as real is called reification, which is central to defining constructs and identifying measurable variables for measuring them. One important decision in conceptualising constructs is specifying whether they are unidimensional or multidimensional. Unidimensional constructs are those expected to have a single underlying dimension and can be measured using a single measure or test. Multidimensional constructs consist of two or more underlying dimensions. In this study, the constructs 'PSICT' and 'TLICT' are conceived as multidimensional.

Operationalisation refers to the process of developing indicators or items for measuring a construct. The combination of indicators at the empirical level representing a given construct is called a variable. A variable may be independent, dependent, mediating, or moderating, depending on how they are employed in research.

Subsequently, in this research, ICT infrastructure, ICT training, Incentive, Facility, Teaching and learning resource have been outlined to be empirically tested to ascertain their fit for use as model dimensions/components for the measurement of the construct 'Pedagogical Support for ICT' (*PSICT*). Also, Teaching and Learning have been outlined to test or measure teaching and learning of ICT (*TLICT*). On the basis of this, an item scale is developed in line with these dimensions of the construct 'Pedagogical Support for ICT' (*PSICT*) as well as the construct 'Teaching and Learning of ICT' (*TLICT*) to be validated through a confirmatory factor analysis (*CFA*) to be used to assess Pedagogical Support for ICT (*PSICT*) availability and the effectiveness of teaching and learning of ICT (*TLICT*) in the basic school. *PSICT* will be an outcome independent variable from the latent independent dimensional/component variables. Teo and Koh (2010) Computer Self-Efficacy Scale was adapted to assess the construct 'Teachers' and students' ICT self-efficacy' (*TSICTSE*).

Scaling is the process of creating the indicators or items for the measurement of a construct. More formally, scaling is a branch of measurement that involves the construction of measures by associating qualitative judgements about unobservable constructs with quantitative, measureable metric units. Scaling is the assigning of objects to numbers according to a rule (Stevens, 1946). The outcome of a scaling process is a scale, which is an empirical structure for measuring items or indicators of a given construct. A unidimensional scale measures construct along a single scale while multidimensional scales employ different items, indicators or test to measure each dimension of the construct separately and then combine the scores on each dimension to create an overall measure of the multidimensional construct.

3.2 Empirical Review

An empirical literature, also referred to as systematic literature review, examines past empirical studies to ascertain and compare results in the topic area with the view to seeing/identifying and appreciating points of convergence and points of divergence of results of past studies. By so doing, the empirical review thus, enables the researcher to identify research gaps in terms of methodology, research focus and results to carefully position his or her study. In addition, the empirical review helps compare results of the current study to past studies. The empirical review requires an examination of past papers in the subject of study to answer a very specific empirical question by analysing data to come to a clear response. Empirical literature in the topic area such as ICT integration and teachers' and students' ICT self-efficacy is extensively reviewed with the view of helping to properly position the study.

3.2.1 Studies Related to Pedagogical Support for ICT and ICT Self-Efficacy in Teaching and Learning of ICT in School

In this section, an attempt will be made to discuss the few studies carried out directly or indirectly related to pedagogical support for ICT and ICT self-efficacy in teaching and learning of ICT with the view to identifying the gaps in these studies, which the present study will seek to fill. This is so because actual studies on PSICT in teaching and learning of ICT are hard to find. The review will concentrate on studies that sought to examine ICT integration in school, challenges hindering ICT teaching and learning, effectiveness of ICT teaching and learning, and teachers' and students' ICT self-efficacy in schools and show how they relate to this present study.

3.2.1.1 Studies Involving ICT Integration in School or Education

Studies involving ICT integration in education or school can be unlimited but only a selected few, most relevant to the present study, are reviewed to aid discussion of the topic and to help properly position the present study.

Jingtao et al. (2010) undertook a study on the application of ICT in instruction in Chinese basic schools. The purpose of the study was to find out the best application practices that support students' instruction and problem-solving abilities. This study is related to one of the research questions of the present study which seek to find out pedagogical support for ICT. The study found that numerous instruction software, platforms, IT tools and products as well as new models of application, such as one-to-one e-learning, mobile education, miniature learning and digital whiteboard-based interactive learning, have been developed to facilitate ICT integration in teaching and learning. It was again found out that some schools also limit the physical contact with their students through the use of SMS, e-mail, internet platforms such as Facebook, WhatsApp, and virtual zoom video conference meetings, Learning Management Systems (LMS), among others.

The first finding of the study underscores the relevance of the provision of hardware and software ICT infrastructure in integrating ICT in teaching and learning. Second, the effective development and use of ICT platforms in teaching and learning limits physical contact with students. The finding portrays ICT infrastructure to be relevant to ICT teaching and learning. But the irony is that the provision of adequate ICT infrastructure is a problem in ICT integration in many school environments. This is confirmed by the work of Obota, Oluoch and Makani (2015) to assess the availability of ICT infrastructure for Curriculum Instruction in Public Secondary Schools in Mumias Sub-County, Kenya, who found out that ICT facilities in the schools was a

problem and recommended schools should involve their governing bodies to facilitate provision of ICT infrastructure. This is further corroborated by Kiptalam et al. (2010), who observe that access to ICT facilities is a major challenge facing most African countries in ICT integration. The use of ICT platforms to limit contacts with students also require the ICT teacher competency in ICT use. Lack of teacher professional competence has been found to constitute a hindering factor to the integration of new technologies in class (Drossel et al. 2015; Eickelmann, 2011). In confirming this, a study by Banu (2012) reported that teachers were facing many challenges in introducing ICT into classroom teaching and use, and this was due to lack of relevant knowledge and skills. What the findings of the study is suggesting is that adequate pedagogical support for ICT infrastructure provision and training of teachers to develop competencies in ICT use should be a prerequisite for effective ICT integration in school. It is in the light of this need that this study aims at finding out comprehensively the pedagogical support for ICT available for teaching and learning of ICT in Ghana, specifically, in the context of the basic school.

The study of Espinosa and Caro (2011) looks at ICT integration in the Philippine basic schools using the Delphi technique involving 26 experts from academia, government, and industry. In two groups, Delphi I and Delphi II, the experts shared their opinion in three and two rounds of discussions respectively. Espinosa and Caro find that ICT policy and strategy has standard deviation of 6.51, whilst student learning outcome has 4.42 standard deviation. The relatively bigger standard deviation of 6.51 for Delphi I means experts in the group differ widely on the impact of ICT policy and strategy on ICT integration in basic schools. Also, the relatively smaller standard deviation of 4.42 for student learning and outcome means there was much consensus among experts on the effectiveness of student learning outcome on ICT integration. The

opinions of the experts did not differ much for Delphi II. According to Espinosa and Caro (2011), experts from academia regard ICT infrastructure as the fulcrum in ICT integration. Thus, the role of ICT curriculum, the competency of the ICT teacher, and the attitude of the student towards learning ICT could not compare with ICT infrastructure in ICT integration because those aspects have largely been adequately dealt with. By implication, experts in academia, whilst identifying ICT infrastructure as the most important in ICT integration, hold the view that problems of ICT infrastructure in schools remain unsolved. Nevertheless, they, to a very much extent, also acknowledge the important role of ICT curriculum, the competency of the ICT teacher, and the attitude of the student towards learning in ICT integration. On the other hand, experts from government consider ICT policy as the most important in ICT integration. Thus, they place emphasis on the role of government in terms of policy. Lastly, experts from industry place equal value on both ICT infrastructure and policy, curriculum, teacher competency and student learning outcome. It is important to note that the backgrounds of the experts colour their opinions about ICT integration. While those in academia stress the role of government because lack of effective ICT integration must not be blamed on the academic institutions, the experts from government rather emphasise policy, which is their domain to demonstrate the importance of their role. Probably, experts from industry are less concerned about the means but the end. Hence, they placed emphasis on what will make the student acquire employable skills. They prioritise teacher competency in teaching ICT and availability of ICT infrastructure as necessary components of ICT integration. What Espinosa and Caro (2011) adds to Jingtao et al. (2010) is that successful ICT integration not only require adequate ICT infrastructure and competent ICT teachers but also a good ICT curriculum and the right ICT policy by the government.

The study of Unwin (2005) explores the gap between advocacy for ICT education in Africa and the integration of ICT in teaching and learning to propose a framework which gives a new direction to the agenda to integrating ICT in our educational system. The study concludes that six basic principles of good practice be adopted for effective ICT integration in our educational system. They are the need for a paradigm shift from ICT education to the application of ICT in teaching and learning. This requires that ICT education be designed to train teachers to apply ICT in teaching and learning rather than developing ICT skills to present old educational content in a different mode. Again, there should be integration of ICT into the whole curriculum; not aspects of it. This implies using ICT tools and resources such as print media, audio, video computers and the internet as an integral part of every educational process rather than using them as panoply of ICT items for exhibition. There is also the need to integrate ICT between pre-service and in-service teacher training. Thus, in the course of the training of teachers, ICT should be part of it to make teachers adequately resourced in using ICT in teaching, as it is necessary to incorporate ICT in teaching and learning and in-service training in the course of the teaching service. Further, redesigning the content of ICT education to reflect the local environment has been highlighted.

This stresses local content in ICT education as called for in ICT for Development (ICT4D) in international meetings such as in the first phase of the World Summit on the Information Society (WSIS) held in Geneva in December 2003. However, as local content implies loss of market for foreign companies with the experience to promote it, it's been extremely difficult to promote ICT local content in African educational system. Against this background, another element of good practice proposed by Unwin (2005) is the need for partnership between governments, the private

sector, civil society organisations, institutions of learning and international organisations in the provision of ICT tools and resources in education. Each of them has a role to play. While African governments want to champion technological change in their territories, international organisations want to bridge the digital divide and private agencies want to promote their business potentials. Academic institutions want to share their findings from their research and civil society organisations try to facilitate delivery of schemes in their environment. The need for partnership is as a result of the huge financial burden on African governments to provide ICT equipment and resources single handedly. Lastly, good practice in ICT education requires developing and sustaining cost-effective models. Cost is always a problem in every life endeavour, especially in capital-intensive ventures, like technological development. ICT cost relates to cost of replacing faulty or outdated computers, maintenance cost, cost of internet connectivity and electricity, cost of new generation of software, and cost of consumables such as paper and ink.

In a cross-sectional survey method through the use of questionnaire for data collection and descriptive statistics for the data analysis involving 63 public primary schools in cape coast, Ghana, Acquah (2012) sampled the opinions of 84 teachers who were randomly selected from the schools to find out the perception of the teachers about the introduction of ICT and the availability of facilities for teaching ICT at the basic level, the content knowledge of the teachers on ICT and the in-service training they receive in teaching the subject. This study is relevant to the present study, as the present study's focus is the introduction of the ICT curriculum in Ghanaian basic schools and the support available for its teaching and learning.

The study found that teachers have positive attitude towards teaching ICT but there was lack of facilities to do that. Positive attitude towards teaching of ICT,

according to the researcher, means teachers could handle the content without difficulties, students could appreciate the content of instruction, and the scope of the ICT curriculum is well within the reach of pupils at the basic level. Also, many of the teachers have a good measure of content knowledge in using ICT facilities in teaching. Majority of the teachers also prefer workshop on ICT as a form of in-service training. Acquah (2012) attributes this choice to the possibility of meeting colleague ICT teachers to share ideas on the teaching of ICT at the basic level, though, teachers could also update their knowledge on ICT through attending conferences, seminars, and personal private studies, among others. This study further confirms the important role of ICT infrastructure to teaching and learning, especially the ICT programme but there is lack of it in many schools. Teachers also have positive attitudes towards ICT teaching and learning perhaps because of their participation in in-service workshops to update their knowledge. This re-emphasises the essence of in-service training of teachers in ICT to the effective integration, teaching and use of ICT in the school.

The first conclusion drawn from the above reviews is that ICT integration requires adequate provision of ICT infrastructure, competent teachers, good ICT curriculum, and ICT policy. The second is emphasising ICT application/use and integrating it in the whole school curriculum as well as in pre-service and in-service training of teachers. The third conclusion is the need to develop partnerships in the integration of ICT into education, especially in the area of provision of ICT infrastructure in schools. The fourth is that ICT infrastructure and training, though prerequisite for ICT integration, generally are lacking in many schools. The question the researcher is asking is whether these are the only prerequisites for the successful integration of ICT and to what extent support is available to providing these prerequisites to schools. To what extent are teachers and students able to apply ICT

aside the theoretical teaching and learning of the subject? It is, however, important to note that most of the studies involved teachers and not students. The present study involved both teachers and students.

3.2.1.2 Studies Involving Challenges Undermining Teaching and Learning of ICT

In the year 1998, Krysa conducted a research to determine and examine regularly occurring factors that affect the implementation of the ICT technology among school teachers. A qualitative study among four school teachers was carried out to identify the factors. Based on the findings, it was reported by one of the teachers that outmoded hardware limits the use of computers in instruction (Krysa, 1998). The teacher was not able to integrate technology into instruction due to old and outdated hardware. Conversely, one of the informants stated that limited software act as one of the antecedents that prevent the use of computers as an instructional tool (Krysa, 1998). Krysa's finding is corroborated by Amenyedzi, Lartey and Dzomeku (2011). A study by Amenyedzi, Lartey and Dzomeku (2011) among second cycle schools in the Tema Municipality point to problems in ICT integration in teaching and learning. According to them, there are problems in ICT integration in Ghanaian second cycle schools because the teachers do not use the computer in the classroom for teaching as most of the schools fail to receive support for the provision of some ICT tools, such as overhead projectors, desktop computers and laptops, which are needed for lesson preparation and presentation in the classroom. It was further pointed out that majority of the schools are yet to set up ICT laboratory or attach ICT resources such as learning software, like Mavis Beacon, and provide internet connectivity to boost the interest of students in the use of ICT in learning.

Obota, Oluoch and Makani (2015), in a study to assess the availability of ICT infrastructure for Curriculum Instruction in Public Secondary Schools in Mumias Sub-County, Kenya, found out that ICT facilities in the schools were a problem and recommended schools should involve their governing bodies to facilitate provision of ICT infrastructure. In another study, Kiptalam and Rodrigues (2010) observe that access to ICT facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in the developed countries. The conclusion that can be drawn from these observations and research findings is that there is limited access to ICT infrastructure in schools in developing countries despite the essential role it plays in instruction and learning of subjects, particularly the ICT programme. This conclusion is corroborated by Ajayi, Ekundayo, and Haastrup (2009). In their study, they claimed it appears some of the ICT facilities used in the teaching and learning process as identified by Babajide and Bolaji (2003), Bryers (2004), Bandele (2006) and Ofodu (2007), which include radio, television, computers, overhead projectors, optical fibres, fax machines, CD-Rom, Internet, electronic notice board, slides, digital multimedia, Smartboard, video/ VCD machine, are not sufficiently provided for teaching and learning in the secondary schools. They stressed that the effective use of the various methods of the ICT in teaching and learning depends on the availability of these facilities (infrastructure) and teachers' competence in using them. The researcher is of the view that the role of ICT infrastructure becomes more important when it comes to the teaching and learning of the ICT subject in particular and as well the use of ICT in the school.

Danso and Kesseh (2016) undertook a study to assess challenges undermining the teaching of ICT as a core subject in Senior High Schools in Ghana using some selected schools in the Kumasi Metropolis. This study is related to the present study

which seeks to assess availability of support for teaching and learning of ICT in Ghanaian basic schools. The key findings were that all the 80 (100%) respondents strongly agree that inadequate trained ICT teachers, inadequate learning and teaching materials, lack of ICT infrastructure, lack of constant power supply, high cost of internet connectivity and high cost of ICT equipment are the main challenges undermining the effective teaching of ICT in the senior high schools. What this finding portrays is that the availability or provision of the afore mentioned issues is relevant and enhances the teaching and learning of the ICT curriculum and the lack of support for their provision can be real challenges to undermine the teaching of the ICT subject in schools. This goes to explain why Obota, Oluoch and Makani (2015) recommended that school governing bodies in Public Secondary Schools in Mumias Sub-County, Kenya, should involve their governing bodies in providing the needed support to facilitate ICT teaching and learning. Of course, governments and education stakeholders in African countries must also provide support for the teaching of the subject because, as Kiptalam et al. (2010) observe, access to ICT facilities is a major challenge facing most African countries. The provision of relevant support can be a measure to mitigate the challenges that undermine ICT teaching and learning in school.

Ajayi, Ekundayo, and Haastrup (2019) also undertook a study on the application of information and communication technology in Nigerian secondary schools. The study investigated the level of availability of ICT facilities in schools for ICT teaching and learning, the capacity for using ICT facilities for teaching and learning, the perceived benefits of using ICT and the problems facing the use of ICT in secondary schools. This study is related to two of the research questions of the present study which seek to find out the availability of pedagogical support for ICT teaching and learning and also teachers' and students' self-efficacy of ICT use. The study revealed that ICT

facilities were lacking in schools, and teachers and students were, to a little extent, exposed to the use of ICT. The study also revealed some of the challenges facing ICT teaching and learning in secondary schools as irregular power supply, inadequate computer literate teachers, high cost of purchasing computers in schools, inadequate facilities to support full application of the ICT and lack of fund. What the finding suggests is that there is general lack of necessary pedagogical support provision for ICT teaching and learning; hence, the existence of the challenges. It is in the light of these challenges affecting schools in the implementation of the ICT curriculum that this study aims at assessing the availability of pedagogical support for Ghanaian basic schools in the teaching and learning of the ICT subject, since previous studies have focussed on the challenges of ICT teaching and learning in the secondary school and basic school but not support available for its teaching and learning in the context of the basic school.

3.2.1.3 Studies Involving Effective Teaching and Learning of ICT

In a survey of teachers and students in second cycle schools in the Tema Municipality, Amenyedzi, Lartey & Dzomeku (2011) use stratified sampling technique to select a sample of teachers and students to examine how teachers use the computer and internet to improve the effectiveness of their teaching and also how students make use of ICT facilities to improve their learning. The study found that 92% of the teachers were computer literate and 78% of the students had basic knowledge in using the computer to learn. These include using ICT resources to search for information from the internet to do their assignments, for sending e-mails and for social networking. This helps them to complete their assignments on time, solve naughty problems they could not have solved without the support of ICT, improve their typing skills, learn about the history of people and events around the world via the internet and/or worldwide

projects, like Global Teenager Project, and also expose them to research, among others. The teachers also use the search engines, like Google Scholar, and Sci-Hub, and others to search for information in their subject areas from the internet. They also use the ICT tools for preparing lessons plan, scheme of work, calculating student's assessment scores and for social networking to improve communication among themselves. Some of the teachers also use the computer for demonstration and for drill and practice to facilitate the acquisition of basic skills by students.

The work of Kaffash, Kargiban, Kargiban & Ramezani (2010) reviews different theoretical frameworks and approaches to ascertain the application of information and communication technology (ICT) in the curriculum of the formal school system. The aim is to provide a structural framework that will help to identify the problems in the application of ICT at various levels of the educational system. The focus of their work is on the intended, implemented and achieved curriculum. Kaffash et al. (2010) highlight that the intended curriculum is the top-level policy aims and strategic decisions on how ICT should be taught in school; the implemented curriculum is the middle-level teaching and learning approaches adopted to teach ICT in school; and the achieved curriculum entails the base-level actual learning activities as well as the experiences of students in learning ICT and the outcomes of their learning. They attribute the difficulties in implementation of the ICT curriculum to many factors, one of which is the lack of clear goals of implementation due to the emphasis on varied IT-related skills. This means ICT parse has different aspects such as hardware and software with other sub-divisions of the above-mentioned. Another problem of implementation relates to the mismatch between the theoretical framework adopted – behaviourism – and the theoretical grounds upon which the implementation is done – constructivism. Thus, while education is based on influencing attitudes and ideas, the implementation

is often based on abstraction. For example, schools in rural communities often learn ICT without having a practical feel of the computer and related equipment. Lastly, ICT has an interdisciplinary outlook as its application permeates other academic courses. However, Kaffash et al. (2010) could not explain satisfactorily which of the curriculum among the intended, the implemented or the achieved curriculum has the greatest impact in ICT integration. They could also not explain the extent to which the combination of the three aspects of the curriculum complements one another for better integration.

In a survey of two differentiated samples of university teachers using the Inventory of Learning Activities with Technology, Marcelo and Yot-Domínguez (2019) use semi-structured interviews to collect data on how university teaching is responding to technology changes in the teaching and learning process. They also were concerned with the integration of technological knowledge in the faculties into pedagogical content knowledge. The study found that the focus of technology integration in the university is more on the university teachers' application of technology in teaching than the students' use of technology in learning. This finding implies that the institutions are not living up to expectation, since the ultimate aim of technology integration is more on how it benefits students than it does lecturers. The study further confirms that the techno-pedagogical content knowledge of teachers influences technology integration. That is to say teachers' technological self-efficacy determines whether they use technology or not. In this light, Marcelo and Yot-Domínguez (2019) explain that intrinsic factors such as the instructor's knowledge, perceptions and beliefs about the use of technology as well as extrinsic or contextual factors, like the course (subject) being taught and the institutional policy about technology integration, influence teachers' technology usage. In simple terms, where

the teacher perceives technology is facilitating the teaching of his or her course, he or she adopts it in teaching and vice versa. This further implies that there is the tendency for two teachers to integrate technology in teaching differently based on their perceived utility of the technology in teaching.

3.2.1.4 Studies Involving Teachers' and Students' ICT Self-Efficacy in School

A survey of 708 teacher trainees in Singapore through self-reported ratings on a seven-point likert scale was conducted by Teo and Koh (2010) to determine their computer self-efficacy. This study is related to one of the research questions of the present study, which seeks to assess teachers' and students' ICT self-efficacy in the school. The exploratory factor analysis (EFA) done on an initial sample of 354 indicates that teachers' computer self-efficacy was influenced by three multidimensional factors: Basic Computer Skills (BCS), Media-Related Skills (MRS), and Web-Based Skills (WBS). This simply means the three constructs of BCS, MRS and WBS jointly determine the teachers' computer self-efficacy. Therefore, several variables related to ICT use have been assessed to jointly measure the BCS, MRS and the WBS skills: the trainers' ability to search for information from the internet; ability to use word processor to process documents; using presentation software like Microsoft PowerPoint to present lessons; the ability to use spreadsheet like Microsoft excel to record data, compute numbers and present data in the form of tables and graphs; use of electronic mail such as Hotmail, Outlook, Yahoo, Gmail, and MyEdumail to send information; ability to use website Editors like Microsoft FrontPage and Macromedia Dreamweaver to create and modify web pages; competence in using video editing software such as Adobe Premier; Microsoft Movie Maker and Ulead VideoStudio; using graphic Editors such as Microsoft Paint and Adobe Photoshop to create or modify teaching resources; ability

to employ animation software like Macromedia Flash, Authorware and Director to create animations to facilitate teaching and learning; ability to use blogging; and using conferencing Software like Yahoo, IM, MSN Messenger, ICQ and Skype; using learning management system like Blackboard, IVLE, WebCT and Moodle in teaching. The study confirms high computer self-efficacy for BCS (M=6.26), fairly high for WBS (M=5.52) and weak for MRS (M=3.56) among the Singapore teachers. This implies that the teacher trainees have high scores for some of the variables – BCS – but low or poor for the other variables – MRS. However, taken together, the teachers have high self-efficacy of computer use. This study, however, only focussed on teacher trainees and not practising basic school teachers or students.

A survey of 352 pre-service social studies teachers who learnt Instruction Technologies and Material Design course was conducted by Akbaba (2013) to determine their perceptions of the use of instructional materials in teaching. Inferential statistics using two-way ANOVA and correlation analysis techniques were adopted to analyse the data. The result shows that teachers have a significant positive attitude towards the teaching profession and their self-efficacy towards the use of instructional technology in teaching ($p < 0.01$); and their perception about the use of instructional technology in teaching is positively related to their self-efficacy towards teaching. Thus, the teachers' self-efficacy is proportionally related to their use of instructional technology in teaching. This finding is relevant to the present study because ICT is a principal component of instructional technology. This study also did not look at the ICT self-efficacy of students.

In a study involving 337 students of introduction to educational technology, Wang, Ertmer, and Newby (2004) employ 2X2 (Vicarious Experiences X Goal Setting) factorial research design to explore the effects of vicarious experiences and goal setting

of pre-service teachers on their computer self-efficacy perceptions in technology integration. Online likert-type self-efficacy scale was used before and after the course to assess the students' self-efficacy perception. The study confirms that vicarious experiences, provided through CD-ROMs, have greater impact on self-efficacy regardless of goal setting. In addition, students who used specific goals showed similar higher increases in self-efficacy beliefs.

Using a hybrid technique made up of factor, path, and regression analyses to analyse the data collected from 55-parameter questionnaire, Hardyanto, Purwinarko and Adhi (2018) assess students' use of ICT to generate a framework that is integrated to meet the goals of the ICT curriculum. Based on the Technology Acceptance Model (TAM) used and also a Crombach's Alpha coefficient of more than 0.6 for the questionnaire instrument used, the study concludes that computer self-efficacy will affect perceived ease of use which, in turn, affects perceived usefulness. Then, perceived usefulness affects attitude, which also affects behavioural, and the behavioural affects actual use in that order. As perceived ease of use is determined by computer self-efficiency, which ultimately determines the ICT integration, it means that computer self-efficacy is a precondition to ICT integration. Put differently, the ability of students to use ICT equipment and resources to complete a task determines the success of ICT integration.

A survey of pre-service English teachers in a university using smart partial least squares (smartPLS) software to analyse the data on factors affecting teachers' technology integration in foreign language by Rafiee and Abbasian-Naghneh (2019) reveals a structured form of relationship among the perceived usefulness (PU), perceived ease of use (PEoU), e-learning motivation (ELM), online communication self-efficacy (OCS), language learners' acceptance (LLA) and readiness of e-learning

(RoEL). The study finds ELM to influence e-learning the most, due to PU and PEOU of the learners. ELM is 'the desire and refreshment state of having physical, cognitive and affective components inside and prompting people to do things for e-learning' (Yilmaz, 2017, p. 252). Since e-learning is individualised and independent, there should be enough motivation to encourage students' participation (Khan, 2009) because the literature confirms that motivation to participate influences student success positively (Saade & Kira, 2007). Therefore, the study concludes that PU and PEOU are the two most important determinants of e-learning acceptance and readiness of students. This means that students will be more prepared to learn the ICT programme, if they perceive the ICT programme useful and have the ability to use it.

A mixed method investigation by Popa and Topală (2018) used online questionnaires and focus-group interviews to collect data from a non-randomised sample of 200 Romanian undergraduate students. The study employed cross-sectional design using two groups of technical and non-technical specialisations to investigate the relationship of students' self-perceived digital competencies and the relevant attitudes, and their level of self-direction in learning as well as their perception of how teachers relate to the use of technology in teaching and learning. The study found that the level of self-direction of the students is positively correlated to their frequency of use of digital tools and resources in learning at 0.001 significant level. This means students' self-directed learning resulting from their self-efficacy in technology use leads to a favourable attitude towards technology use in learning. Thus, self-efficacy is positively related to technology use in learning. The study also reports that all the students have at least one online social network account on Google (51%), Facebook (49%) or YouTube (35%) as well as an insignificant number of them on Instagram,

Yahoo, ResearchGate, Academy, and Twitter. The mobile phone, laptop, desktop and tablets are the ICT gadgets they often use.

In a study of 401 K-12 teachers, Durak (2019) uses structural equation modelling technique to create a screening model which was applied to explain the relation between the teachers' level of Technological Pedagogical Content Knowledge (TPACK) and their self-efficacy in technology integration, technology literacy and the objective of social network usage. The study finds that the teachers' Technological Pedagogical Content Knowledge (TPACK) is the most important determiner of technology integration. Hence, teachers' effective technology integration is achieved best through the nurturing of the teachers' beliefs and perception about technology integration. However, Farjon et al. (2019) argue that the use of technology, skill and attitudes towards technology varies based on time periods and the working group. Hence, self-efficacy is no longer a determiner of technology integration, since everything is technology-based in the contemporary world. Hence, it's automatic for one to integrate technology in work or be alien to the system. The study of Durak (2019) finds no relation between teachers' technology literacy and technology integration, and also indirect relation between TPACK and social media usage for educational reasons. Overall, the study of Durak (2019) confirms that TPACK contributes a positive attitude to teacher's technology integration self-efficacy. However, the study subjects are basically technology-trained teachers who could hardly fail to appreciate the importance of technology in teaching and learning, unlike teachers who train in institutions other than technology training institutions. Arguably, the background of those 'ordinary' teachers could have presented a better picture of teachers' attitudes towards technology integration.

Sarfo, Amankwah and Konin (2017) investigated Computer Self-Efficacy among Senior High School Teachers in Ghana and the Functionality of Demographic Variables on their Computer Self-Efficacy. Regarding self-efficacy, the study found that, generally, the teachers were not certain about their Computer Self-Efficacy but specifically agreed that they were self-efficacious in basic computer skills but not certain about their self-efficacy in web-based skills and also, not self-efficacious in media-related computer skills. While this study is also relevant to the present study, it only looked at teachers in senior high schools and not both the perspective of teachers' and students' in the basic schools.

Gbemu, Sarfo, Adentwi and Aklassu-Ganan (2020) investigated teacher educators' self-efficacy beliefs and actual use of ICTs in teaching in the Kumasi Metropolis using teacher educators in colleges of education. They found out that the teacher educators were not certain on their ability to use ICTs in their teaching, as a result, not actually using such tools in their teaching. Their study is relevant to this present study but their findings do not address the current problem the study intends addressing because they used only teacher educators in colleges of Education without involving the students to consider how it also affects learning. The context of the study was also colleges of education and not basic schools.

The conclusion that is drawn from these studies is that ICT self-efficacy of teachers and students affects their actual use of ICT in completing task. Since the purpose of the ICT curriculum is to enable students acquire ICT knowledge and skills and apply them in task performance, teachers' own ICT self-efficacy as well as students' ICT self-efficacy becomes an important benchmark or measure of the success of the ICT curriculum. The ICT self-efficacy of students can be influenced by teachers

own ICT self-efficacy of ICT use and teaching of ICT. It therefore becomes necessary to assess teachers' ICT self-efficacy.

3.2.2 Conclusions Drawn from the Empirical Studies Reviewed

From the above reviews, a number of conclusions can be made. First, it appears no prior study had focussed on pedagogical support for ICT in teaching and learning of ICT. However, adequate support for the teaching and learning of ICT in school is perceived to be problematic because it is expensive, according to Asiedu-Addo, Apawu, and Owusu-Ansah (2016). Also, as observed by Lindfors (2007), Hennessy, et al. (2010), Ghavifekr and Rosdy (2015), and Barakabitze et al. (2019), the review reveals that most global ICT studies have focussed on ICT integration and use at work and in teaching but not PSICT in teaching and learning of ICT as a subject of study, and teachers' and students' ICT self-efficacy in schools, and the few local studies have also focussed on the challenges of ICT integration into the school curriculum (Opoku, 2016; Ayeh, 2009; Boni, 2018; Sey, 2013; Malcolm & Godwyll, 2015; Acquah, 2012; Natia & Al-hassan, 2015). Furthermore, it appears there are limited studies conducted on effectiveness of ICT teaching and learning and teachers' and students' ICT self-efficacy in schools in developing countries, including Ghana. Sarfo, Amanwah and Konin (2017), for instance, only looked at computer self-efficacy of high school teachers and the functionality of demographic variables and not influence of pedagogical support for ICT in teaching and learning of ICT and teachers' and students' ICT self-efficacy in the basic school.

Studies on ICT in the context of Ghana have not previously focussed on the teaching and learning of ICT, and teachers' and students' ICT self-efficacy in the basic school after its introduction into the curriculum of basic and senior high schools in 2007. It appears that in most of the national and international studies on ICT in general

as well as in the particular context of ICT education, the research designs mostly used have been surveys and case studies, which have employed quantitative or qualitative approaches but not necessarily the mixed method approach (World Bank, 2013; Alameen, Male, & Palaiologou, 2015). Most of the related studies reviewed either focus on teachers (in-service teachers, pre-service teachers/ teacher trainees) in isolation or students and not the perspective of both teachers and students. It appears there is scanty literature and low research on pedagogical support for teaching and learning of subjects (PSTLSs), including the ICT. The limited literature available, however, indicates that support received by teachers and students in the school influence the teaching and learning of a subject such as Mathematics (Arthur, 2017). Implementation of ICT in school requires support (Adi, 2010). However, not much is known empirically about the PSICT available in the school for implementers (teachers and students) in implementing the ICT curriculum in the pre-tertiary education system in Ghana since its introduction into the educational curriculum of schools in 2007. The issue of pedagogical support for ICT teaching and learning, and teachers' and students' ICT self-efficacy in the specific context of basic schools in Ghana has not been previously investigated. Local and international literature on pedagogical support for ICT (PSICT) and its components and a scale for assessing the phenomenon as well as a scale for assessing Teaching and Learning of ICT (TLICT) in school appear not available.

The researcher, therefore, seeks to fill these voids in terms of contribution to literature, methodology, research focus and scope, and instrument for assessment regarding pedagogical support for ICT in teaching and learning of ICT, and teachers' and students' ICT self-efficacy in basic schools in Ghana. Basic schools are the focus of the research because there appears to be a general perception that a myriad

of issues militate against effective teaching and learning at this level of education in the country.

3.3 Theoretical Framework and Review of Theories

A theoretical literature review discusses relevant theories to define and explain key concepts in a research work, proposes relations between them to help support or provide understanding of the problem/topic of study. A strong theoretical review gives a research work direction and allows the researcher convincingly interpret, explain and generalise findings of the study. A theory is a well-substantiated set of ideas which attempt to systematically explain how something works (Sam, Dzakpasu & Ayikue, 2020). The social support theory is the main theoretical framework underpinning this study. Other theories, such as learning theories, self-efficacy theory and some theories of motivation, have been reviewed to enhance understanding of the study.

3.3.1 Theoretical Framework (Social Support Theory)

The main theory that undergirds this study is the Cullen's 1994 social support theory. Cullen argued that social support is a key theoretical concept influencing the likelihood of individual criminal behavior, and that, the more social support (informational, instrumental, emotional, appraisal supports) the individual received, the less likely it is that the person will engage in delinquency and crime. Social support theory focuses on how something positive can prevent or reduce risk for crime (Cao et al., 2010). It can be conceptualized as perceived, feeling supported or feeling that support is available, versus received, reporting that assistance was available (Thoits, 2011). Social support is the means by which human provide psychological and material

resource assistance or aide to help individuals cope or improve an undesirable condition, situation, or a phenomena.

Social support theory is centred on the proposition that instrumental, informational, emotional, and appraisal supports reduce the likelihood of delinquency and crime or promotes and enhances one's wellbeing or situation. Social support is the perception and actuality that one is cared for, has assistance available from other people, and most popularly, that one is part of a supportive network. Social support is commonly categorised into four types of supportive behaviours: Informational, emotional, instrumental/tangible, and appraisal. Thus, supportive resources can be emotional, (eg. nurturance), informational (eg. advice), or companion (eg. sense of belonging); tangible (eg. financial assistance), or intangible (eg. personal advice); appraisal (eg. supervisor positive comment/compliment). According to this theory, social support protects, better or improves undesirable conditions or situations of people and events. Support can come from many sources, such as family, friends, coworkers, organisations and government.

No agreement has been reached by researchers on a comprehensive universal definition of social support and its dimensionality. Many researchers have, however, questioned the restricted use of social support theory in health and few other areas and advocated expansion of the theory and its application to other areas and, more importantly, a contextual definition and application of the social support theory. Subsequently, Williams (2005) uses the concept of social support in the specific context of the new family to highlight the essence of the instrumental, informational and emotional support for a new family. In recent times, therefore, social support theory is studied and applied across a wide range of disciplines including psychology, communication, medicine, sociology, nursing, public health, rehabilitation, social work

and education with varied focus and application. Social support has been linked to many benefits, for instance, physical, mental health and in task performance.

In this study, the researcher used the social support theory in the specific context of ICT education by making a case or explaining how pedagogical support for ICT, particularly instrumental and informational support, can improve teaching and learning of ICT as a subject of study and also enhance teachers' and students' ICT self-efficacy in basic schools. Instrumental social support, which implies the provision of tangible aid and service, and informational support, which implies provision of accurate, timely, necessary and right information, are in line with the researcher's understanding and operational definition of pedagogical support that will facilitate and enhance teaching and learning ICT and teachers' and students' ICT self-efficacy in the school. In the understanding of the researcher, instrumental and informational pedagogical support for ICT in the form of ICT infrastructure, physical facility, resources for teaching and learning, incentive packages and informational support such as ICT training are critical for the ICT programme in the basic school.

3.3.2 Learning Theory

The main learning theories reviewed are behaviourism, cognitivism and constructivism.

3.3.2.1 Behaviourism Learning Theory

The emphasis of Behaviourism is whether internal states or environmental stimuli lead to given responses or human behaviour. Behaviourism, as a learning theory, started in the latter half of the 19th century as a reaction to mentalism. Mentalists study the mind by analogy and by examining one's own thoughts and feelings – a process

called introspection. Introspective psychology relied so much on first-person accounts. Mentalist observations (introspective psychology) were considered too subjective by the behaviourists, as they differed significantly among individual researchers, often leading to contradictory and irreproducible findings. The behaviourist movement, which began in 1913 and led by J.B. Watson and B.F. Skinner, rejected introspective methods as being subjective and unquantifiable. These psychologists wanted to focus on observable, quantifiable events and behaviours. It was the argument of behaviour psychologists that science should take into account only observable indicators. They helped bring psychology into higher relevance by showing that it could be accurately measured and understood, and it wasn't just based on opinions. Watson and Skinner believed that, if they were given a group of infants, the way they were raised and the environment they put them in would be the ultimate determining factor for how they acted; their parents or their genetics do not determine the action. According to Miltenberger (2001), in general, behaviour is what people say and do. The theory of behaviourism, also known as behavioural psychology, concentrates on the study of overt behaviours that can be observed and measured (Good & Brophy, 1990). It explains that all behaviours are learned through interaction with the environment through a process called conditioning without appeal to feelings or thought (Tomic, 1993; Ally, 2008). Learning, which has been defined as a relatively permanent change in behaviour, therefore, occurs due to an individual or an organism's experience or interaction with its environment. Thus, behaviour or learning is simply a response to environmental stimuli. Behaviourism is only concerned with observable stimulus-response behaviours, as opposed to internal events and emotions, in that it can be studied in a systematic and observable manner. As a result, the behaviourist view the mind as a 'black box' in the sense that response to stimulus can be observed

quantitatively, totally ignoring the possibility of thought processes occurring in the mind. Behaviourists believe that all theories should have observable processes such as actions. For them, only overt behaviour should be studied and recorded because inner states, like motives, or mental states cannot be measured objectively (Watson, 1980; 272).

One strength of behaviourism that has been widely highlighted is that because it is based upon observable behaviour, it makes it easier to quantify and collect data and information when conducting research. Also, effective behavioural therapeutic techniques such as intensive behavioural intervention, behaviour analysis, token economies and discrete trial training are rooted in behaviourism. The influence of behaviourism on teaching and learning is also worth mentioning. For instance, it helps us to effectively assess and ascertain behaviour learned by students and that not learned, because they cannot account for or demonstrate the behaviour.

Behaviourism, however, is criticised on grounds that it is a one-dimensional approach to understanding human behaviour and that behavioural theories do not account for free will and internal influences such as moods, thoughts and feelings. The theory is also criticised that it does not account for other types of learning, especially learning that occurs without the use of reinforcement and punishment. This is true because, as can be inferred from the theory, much of the human behaviour and learning abilities were attributed to the effects of external factors that serve as reinforcers or punishers. Another shortfall of the theory that has been highlighted is its failure to recognise that people and animals are able to adapt when new information is introduced, even if a previous behaviour pattern has been established through reinforcement

<http://psychology.about.com/od/psychology.study.guides/a/learningsg.htm>

3.3.2.2 Cognitive Learning Theory (CLT)

One Social Science theoretical postulation directly opposed to the behaviourist thought is the CLT. The school of thought takes its roots from the educational psychologist, Jean Piaget (1896-1980). Contrary to behaviourists' position that environmental stimuli activate given behaviours in humans, CLT stresses the role of the human mind as a mechanism for processing information to construct knowledge (Hishinuma, 1990; Tomic, 1993; Bandura, 1999; DeVries, 2000; Ally, 2008). In regard of this position, the mind is an internal framework for processing information from the environment for knowledge to be constructed rather than just being a receptacle of environmental influences which dictate to it how the information should be acted upon. The researcher thinks that a learned behaviour should be observable and quantifiable through express manifestation or demonstration of whatever that is said to have been learned as advocated by the behaviourist. However, the mind should be seen as the main engine of learning because any outwardly expressed behaviour is the product of the mind; hence, the source of all expressed behaviour or learning is the mind. Though mental states or the mind is not directly observable, observed behaviour is the direct product of the mind and, therefore, a reflection of what goes on or has gone on in the mind. An overt observed behaviour or action can only be explained in terms of the mind or in reference to the mind. All observable learned behaviour are the direct results of the mind. There will be no observed learned behaviour without first mental processes or activities; hence, learning cannot only be explained on the basis of observed behavior, as the behaviourists want us to believe. The researcher, therefore, underscores the value of the cognitive theory also in explaining learning or behavior, while its extremism, just as the behaviourism, is rejected. To the researcher, the two theories should be seen as complementary to explaining learning in totality instead of a

refutation of the other. This is because what is known in the mind or by the mind is what can be overtly expressed as an observable learned behaviour. For the researcher, in explaining learning, both the environmental stimuli and mental state or processes should be seen as major influences.

3.3.2.3 Constructivism Learning Theory

An important variant of the cognitive and behaviourism learning theory is the constructivist perspective attributed to Jean Piaget (Bandura, 1999; DeVries, 2000; Ertmer & Newby 2013). The perspective, which is linked to epistemology – the theory of knowledge - takes an intermediary position between the extreme environmental influences advocated by behaviourism and the extreme internal processes of the mind held by cognitivism. Its core position is that learners construct knowledge based on the interaction of internal factors and their experiences from their social and cultural environments. As such, knowledge is constructed when what the learner has from his or her environment is made to interact with new environmental stimulus. According to Jerome Bruner, learning is done on the basis of the social environment as a ‘scaffold’ (Relevant Previous Knowledge: RPK) to facilitate the acquisition of the new knowledge. However, the RPK is withdrawn as the newly acquired knowledge is internalised. In view of the above position, Piaget postulates that learning occurs through the processes of assimilation and accommodation (DeVries, 2000). In assimilation, new experiences are aligned to the internal framework of the mind without alternating the mind. This means the new experience does not conflict with the architecture of the internal framework. Thus, expectation and new information do not conflict with each other. However, where the new information conflicts with the internal framework of the mind, they change their perception about the experience to

fit the internal framework for learning to occur. On the other hand, accommodation involves altering the internal framework to match new experiences in the environment. When one's expectations about experiences in the environment fails, the person adjusts to the new experiences by altering his or her expectations (internal framework). For instance, one could be building castles in the air. However, when the realities of life dawn on the person, he or she adjusts the unrealistic expectations to match the prevailing circumstances to survive. This way, one learns the proper way things are done.

In conclusion, these three theoretical foundations in Social Science – behaviourism, cognitivism and constructivism - have attempted to account for the process of learning albeit from different points of view. Behaviourists are concerned with overt behaviour that can be objectively measured because internal behaviour cannot be studied based on the manipulation of environmental stimuli. On the other hand, cognitive theorists hold the view that internal mental processes can rather be manipulated to empirically measure external behaviour. In this regard, the architecture of the brain becomes the stimulus which controls external behaviours. In between these two extreme theories is constructivism which explains that the mind relies on the environment to construct knowledge. These basic theoretical orientations would be employed to jointly explain teaching and learning of ICT in basic schools in Ghana, and justify the need for pedagogical support for ICT in teaching and learning of the ICT programme.

3.3.3 Motivation Theory

The goal-setting and expectancy theory of motivation were reviewed to support the study.

3.3.3.1 Goal-Setting Theory

The philosophy behind goal theory is that motivation is driven primarily by the goals or objectives that an individual set for himself. Unlike expectancy theory, where satisfactory outcome is the prime motivator, the goal theory suggests that it is the goal itself that provides the driven force. Locke (1975) first proposed the idea that working towards goals was in itself a motivator. His research indicated that performance improved when individuals set specific rather than vague goals for themselves. Locke further maintains that an individual's motivation is enhanced when feedback on performance is available. Gordon (1965) observes that goal setting focusses behaviour and motivates employees. As people receive ongoing feedback on progress towards achieving their goals, their motivation increases and remains high. Kreitner and Kinicki (1998) contend that, more recently, goal setting has been promoted through a widely used management technique called Management by Objectives (MBO). MBO is a management system that incorporates participation in decision making, goal setting, and objective feedback. The goal-setting theory has been successful in improving performance because the method directs attention, regulates effort, and increases persistence (Kreitner & Kinicki, 1998)

3.3.3.2 Expectancy Theory of Motivation

Greenberg and Baron (2000) indicate that the expectancy theory is based on three different types of beliefs: expectancy, instrumentality, and valence. The expectancy theory was originally contained in the Valency-Instrumentality-Expectancy (VIE) theory which was formulated by Vroom. According to Mullins (2007) the underlying basis of the expectancy theory is that people are influenced by the expected results of their actions. The theory seeks to predict or explain task-related effort, which

is perhaps the most comprehensive motivational theory. The VIE theory suggests that motivation is a function of the perceived relation between effort, performance and desirability of consequences associated with performance outcomes. Expectancy is based on the belief that a particular level of effort will be followed by a particular level of performance. Kreitner and Kinick (1998) observe that Vroom's terminology represents an individual's beliefs that a particular degree of effort will be followed by a particular level of performance. In other words, effort leads to performance expectation. According to Vroom (1964), the following factors influence an individual's expectancy perception: self-esteem; self-efficacy; previous success at the task; help from a supervisor and subordinates; information necessary to complete the task and good materials and equipment to work with. Instrumentality relates to the individual's perception of the probability that a specific level of performance will lead to various outcomes of reward or punishment. The expectancy theory sees people as rational, logical and cognitive beings who think about what they have to do to be rewarded and how much the reward means to them before they perform their jobs.

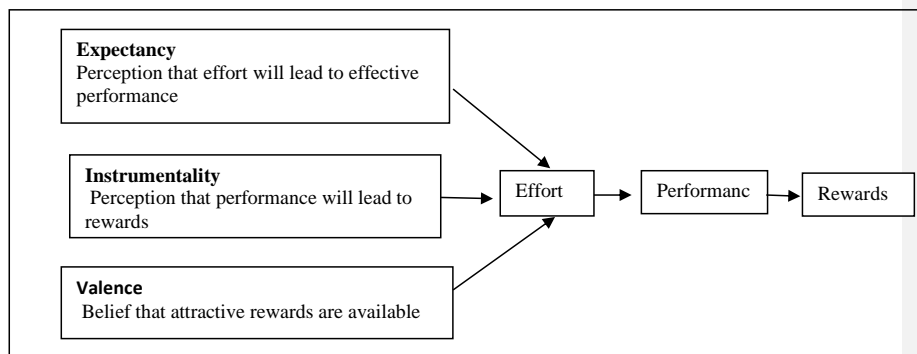


Figure 3.4: Basic Model of Expectancy Theory

Source: Mullins, 2007, p. 270.

3.5 Conceptual Framework Underpinning the Study

Miles and Huberman (1994:18), in explaining conceptual framework, indicated that:

A conceptual framework explains either graphically or in a narrative form, the main things to be studied – the key factors, constructs or variables – and the presumed relationships among them. Frameworks can be rudimentary or elaborate, theory-driven or commonsensical, descriptive or causal.

As cited in Owusu-Mensah (2006), Miles and Huberman (1994) posit that a conceptual framework acts more or less as the current version of the territory where the research is investigating. For Owusu-Mensah (2006), it can be conceived as the navigational map of the researcher. Based on the reviewed literature and the objectives the study sought to achieve, the conceptual framework presented in Figure 3.5 was proposed for the thesis.

The proposed conceptual framework in Figure 3.5 suggests that pedagogical support for ICT (PSICT) can be assessed by using five pedagogical support components. These five dimensions or components are: ICT infrastructure, ICT training; Facility, Resource for teaching and learning, and Incentive. These five components are derived from pedagogical support for ICT (PSICT), and every school require them to effectively teach and learn ICT. The pedagogical support for ICT (PSICT) a school/teachers and students received can impact differently on teaching and learning of ICT and on their ICT self-efficacy (eg. effective Teaching/Learning; ineffective Teaching/Learning; effective Use of ICT; ineffective Use of ICT). Thus, PSICT is presumed to positively or negatively influence the effectiveness of teachers and students teaching and learning of ICT and their ICT self-efficacy in school. High level of PSICT available is predicted to have significant positive influence on the effectiveness of teachers and students teaching and learning of ICT and their ICT self-efficacy in school. On the contrary, low level of PSICT available is predicted to have

significant negative influence on the effectiveness of teachers and students teaching and learning of ICT and their ICT self-efficacy in school.

The implications of the conceptual framework are obvious. It makes it imperative for curriculum planners and developers to consider the issue of pedagogical support for teaching and learning of a subject as an integral part of the whole process of planning and designing the ICT curriculum and, of course, all other programmes of study in the school rather than being an afterthought, in order to avoid deficiencies in implementation. It also brings to the attention of major education stakeholders the need to help provide different pedagogical support to schools in implementing new curriculum programmes. It also demonstrates that PSICT and, of course, support for any curriculum programme revolves around some dimensions or component support needs of schools (teachers and students) and, therefore, provision of PSICT should be targeted at these dimension needs of schools. The framework, if it passes a validity test, provides a comprehensive basis for analysing pedagogical support for ICT, which other researchers can apply in different contexts to provide comparable data. The conceptual framework as presented in Figure 3.5 undergirds the formulation of the specific research objectives, the research questions and the research hypothesis in chapter one of the study.

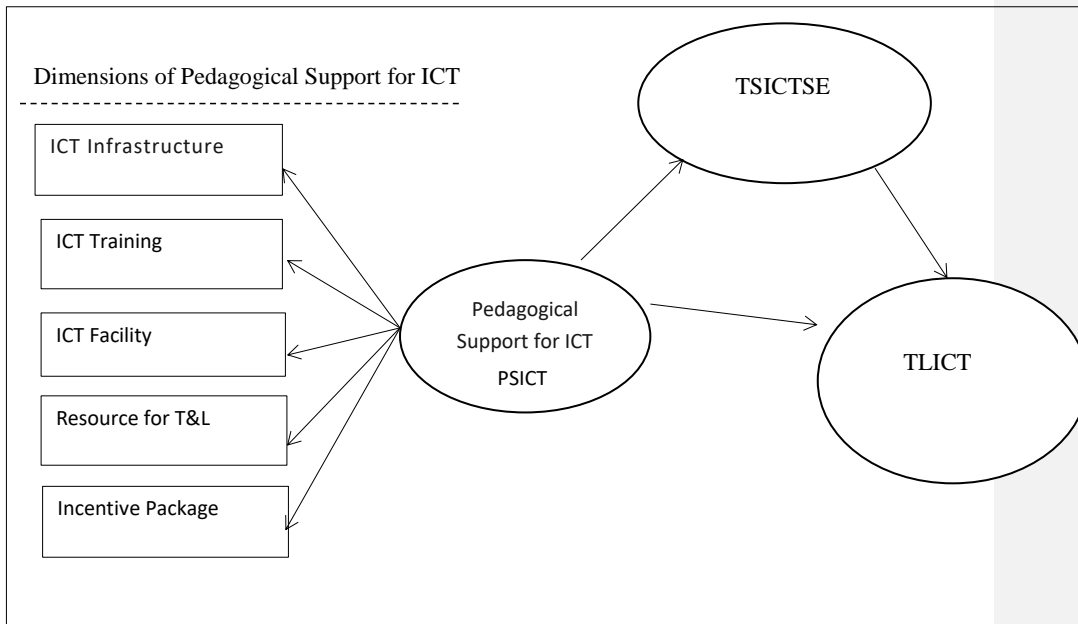


Figure 3.5. A conceptual framework for analysing pedagogical support for ICT availability and teachers' and students' ICT self-efficacy influence on teaching and learning of ICT

3.6 Novelty and Strength of the Study

The novelty this study presents is seen in two ways. First is the comprehensive method used to collect data for the study. It appears this is the first study in ICT education in the context of Ghana in which quantitative and qualitative data are collected to answer the research questions, using a questionnaire instrument, interview, focus group discussion and personal observation in a single study. The degree of triangulation to offset the weaknesses of the use of only one data collection instrument is undoubtedly higher in this study. Particularly, the adoption of the sequential explanatory mixed method design to determine or know the reality (the true state) of pedagogical support for ICT, and the teaching and learning of ICT received in basic

schools is a major strength and novelty of this study. The effect is that the data as well as the results of the study are most likely to be more reliable and valid. This study also appears to be the first, particularly in the context of Ghana, in which an attempt has been made to self-develop a framework and scale to assess pedagogical support for ICT in teaching and learning of ICT. The validated PSICT framework and scale can be adopted by other researchers to assess the availability of pedagogical support for ICT in teaching and learning of ICT in other contexts locally and internationally.

3.7 Summary of Literature

One common phenomenon that has characterised colonial and post-colonial formal education in Ghana has been the introduction of reforms in terms of structure and content. Successive governments have introduced minor or drastic changes in the educational structure and curricular of basic and secondary schools. The introduction of ICT into the educational curriculum of basic schools by the 2007 educational reform is one major change. Irrespective of the nature of the reform or changes introduced in education, one key feature of formal education is teaching and learning of a curriculum programme or subject. However, one issue that has not been widely discussed in the field of education and in most of these reforms is the concept of pedagogical support for teaching and learning a curriculum programme. The task of teaching and learning any curriculum programme or subject in the school requires a great deal of pedagogical support to be successful. Pedagogical support for teaching and learning becomes even more important when it comes to implementing a new curriculum programme. In view of this, it is expected that the introduction of ICT in the basic school curriculum, following the 2007 educational reform, receive much pedagogical support for its effective implementation, for without the necessary pedagogical support provided, the

practical teaching and learning of the ICT programme most likely would be a fiasco. The operational definition or meaning of pedagogical support for ICT teaching and learning in this research context refers to all the tools, equipment, resources, etc. assistance available or provided in the school (provided to teachers and students) to facilitate effective teaching and learning of the ICT subject as well as the use of ICT in the school. Though this definition may encompass a wide range of issues, of principal interest to the researcher is support for the provision of ICT infrastructure, ICT training, incentive, Facilities, teaching and learning resources, in schools to facilitate ICT teaching and learning as well as use in the school.

Pedagogical support is most critical for the implementation or the teaching and learning of the new ICT programme because, according to Fullan (2007), cited in Cobbold and Ani-Boi (2011), all curriculum innovations bring about some level of incompetence, deskilling teachers and students alike, suppressing acquired competencies and demanding the development of new ones. Providing appropriate pedagogical support to teachers and students adequately prepares and positions them to overcome the challenges and difficulties of implementing any new curriculum. The effective teaching and learning of the ICT programme in basic schools is, thus, anticipated to require the provision of various pedagogical supports, ranging from ICT infrastructure, ICT training, Teaching and learning resources and facilities, Incentives/motivation and good power supply in the schools. A review of the literature indicates that these types of support are necessary for the effective teaching and learning of the ICT programme in schools.

According to Moses et al. (2012), it is rooted in literature that ICT infrastructure support can act as a facilitating condition to influence teachers' and students' teaching and learning as well as their use of the technology. ICT infrastructure measures the

perceived availability and suitability of the ICT tools, such as hardware, software, internet access, peripheral equipment and other similar resources in the school (Vanderlinde & Van Braak, 2010; Pelgrum, 2001). ICT training is important for teachers who assume responsibility for imparting ICT skills to their students to interiorise their technological skills and move rapidly from low-level technological knowledge to high level ICT knowledge because their competences in using new technologies constitute an essential prerequisite for the effective teaching of ICT skills in the school (You, 2010). Teachers as well as students, however, appear not to be knowledgeable in the use of ICT, because there appears not to be any official training for both the teachers and the students in the schools (Ajayi, Ekundayo, & Haastrup, 2009). Availability of teaching and learning resources and facilities enhance the effectiveness of schools by improving teaching, learning and academic performance (Maicibi, 2003).

A study by Yara and Oteno (2010) indicated that availability of teaching and learning resources, and facilities, such as classrooms, textbooks, syllabus, notebooks and writing materials, have positive and significant effect on teaching and academic performance in Mathematics. Principal incentives or motivational strategies in school systems such as monetary incentive, a conducive environment, non-monetary incentives, conditions of service, recognition, regular and attractive payment of salary, allowance, bonuses and effective communication are very significant in ensuring the productivity of teachers in the school (Republic of Kenya/UNESCO, 2012). These motivational packages, when in place, push teachers and students to give off their best for the achievement of their teaching and learning goals (Kenney, 2014).

Despite the importance of pedagogical support provision for teaching and learning of the ICT programme, like any other subject as pointed out by the literature,

the availability of these pedagogical supports in Ghanaian basic schools for the teaching and learning of ICT is not readily known by means of empirical studies. This is because, though a lot of studies have been done into ICT education in Ghana, no study has focussed on exploring the issue of pedagogical support for ICT. From the review of the literature, no benchmark model or scale was found to have been used previously to assess this phenomenon of availability of pedagogical support for ICT in teaching and learning of ICT in other contexts. This presents to the researcher the need to self-develop a scale to assess the phenomenon and adapt the Computer self-efficacy scale by Teo and Koh (2010) to assess the aspect on teachers' and students' ICT self-efficacy in basic schools in Ghana. The concepts of teaching and learning are intricately linked together. The major goal of teaching is for the teacher to ensure that students/pupils learn what has been taught. Learning cannot be assumed to have taken place unless students have demonstrated evidence of knowledge acquisition in the teaching and learning process. Teaching has influence on learning. The effective teaching and learning of a subject, such as the ICT, as well as its effective use among teachers and students is assumed to be influenced by pedagogical support for ICT provided or available. The ICT curriculum has its intended goals to achieve, and students and teachers have their teaching and learning expectations so far as the teaching and learning of the subject is concerned. Therefore, the goal setting and expectancy theories of motivation were also reviewed to provide further understanding of the theoretical basis as to why motivation is needed to realise the goals of the ICT curriculum as well as teachers' and students' teaching and learning expectations. The researcher thinks that, in the teaching and learning of the ICT programme as well as in the motivation of teachers and students to attain their teaching and learning expectations and the goals of

the ICT curriculum, various pedagogical supports for ICT are needed; hence, a review of social support theory to undergird the study.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Methodology

Methodology refers to the major approaches or paradigms which guide the conduct of research (Owusu-Mensah, 2006). Research paradigms are approaches or strategies that are used to generate knowledge. There are theoretical underpinnings of the main methodologies that have influenced social science research. Research designs are plans and procedures for research that spans the decisions from assumptions to detailed methods of data collection and analysis. Methods are the specific research techniques, tools or instruments which the researcher employs to collect the relevant data for answering the research questions (Owusu-Mensah, 2006). In social science research, there are several factors that influence the choice of methodology decisions.

4.2 Research Approach and Philosophical Underpinning

The main approaches to conducting research are quantitative, qualitative, and mixed method. Each of these research approaches is underpinned by a different research philosophy and paradigm (worldview) on ontology, epistemology and methodology. A research philosophy can be defined as the development of assumptions, its knowledge and nature (Saunders, Lewis & Thorhill, 2007).

The positivist research philosophy which underpins quantitative research claims that the social world can be understood in an objective way, hence, the need for the researcher to dissociates himself from personal values and work independently. Its view on ontology (what is reality/nature of truth and how it is acquired) is that the reality is objective and perceived. Its view on epistemology (knowledge) is that acquisition of knowledge is not related to values and moral content. Thus, true knowledge is objective,

observable and measurable (Zukauskas, Vveinhardt & Andriukaitine, 2017). Its research method is quantitative [Survey, experiment, quasi-experiment] (Zukauskas, Vveinhardt & Andriukaitine, 2017; Walter, 2006; Mackenzie & Knipe, 2006).

The interpretivist research philosophy is opposite to the positivist research philosophy. Interpretivist research philosophy holds that the social world can be interpreted in a subjective manner. The greatest attention here is given to understanding of the ways through which people experience the social world. In this research philosophy, the researcher performs a specific role in observing the social world. According to this research philosophy, the research is based on and depends on what the researcher's interests are. Its ontological view is that, the researcher and reality are inseparable. Its epistemological position/orientation is that knowledge is based on the abstract descriptions of meanings, formed of human experiences. It lends itself to qualitative research method [case studies, interviews, observation, focus group discussion, ethnography etc.] (Zukauskas, Vveinhardt & Andriukaitine, 2017).

Pragmatist research philosophy deals with the facts. It claims that there is no single way to learning but many different ways of understanding because there are multiple realities, hence, the choice of a research philosophy is mostly determined by the research problem (Saunders, et al., 2012; Collis & Hussey, 2014; & Wilson, 2010). In this research philosophy, the practical results are considered important. Pragmatism does not belong to any philosophical system and reality. It looks at what is best or what works best in the circumstance to get the best or most desired result/outcome. Therefore, researchers have freedom of choice. They are free to choose the methods, techniques and procedures that best meet their needs and scientific research aims. Pragmatists do not see the world as absolute unity. It sees the truth as what is currently in action; it does not depend on the mind that is not subject to reality and the mind

dualism. Pragmatism ontological view is that the reality is ambiguous, but based on the language, history, and cultural respect. Its view on epistemology is that knowledge is derived from experience. The researcher restores subjectively assigned and 'objective' meaning of other actions. Its view on methodology is that different/multiple methods (mixed methods) is appropriate to collect the most relevant data. Hence, uses surveys, experiments, interview, case studies, observation, focus group discussion etc. to collect data (Leedy & Ormrod, 2005; Zukauskas, Vveinhardt & Andriukaitine, 2017; Mertens, 2014; Walter, 2006; Mackenzie, 2006).

Summarising the three research philosophies, positivism typically supports quantitative methods and deduction reasoning, whereas interpretivism emphasises qualitative approaches and induction reasoning. However, pragmatism embraces the two extremes and offers a flexible and more reflexive approach to research design (Feilze, 2010; Morgan, 2007; Pansiri, 2005).

The nature of enquiry for this study is influenced by the pragmatist research philosophy, thus, combines both the positivist and interpretivist paradigms along three dimensions: ontology, epistemology and methodology in line with the views of Denzin and Lincoln (2003). The research approach (mixed method approach) adopted for this study departs from the traditional pure quantitative or qualitative approach often used in many social science investigations.

Knowledge cannot only be generated through experiments and quantitative analysis of phenomenon or only through "thick description" of phenomenon through words. Both approaches (quantitative and qualitative) should be seen as two different ways of generating or gaining knowledge each with strengths and limitations. One can only be superior to the other and preferred based on the nature or issue under investigation and the kind of knowledge the research seeks to discover. Many view the

Commented [WU2]: You only bring the page number when you quote directly with inverted commas.

use of mixed methods approaches as strength when conducting research in education as they conclude that quantitative and qualitative research methodologies are complementary with the potential of expanding and broadening the depth and width of a study (Small, 2011; Patton, 2015; Creswell, 2018; Yilmaz, 2013). The mixed method approach undergirds this study because the researcher intends to look at both the depth and width of the issue of PSICT and TSICTSE in teaching and learning of ICT (TLICT) in basic schools in Ghana.

Creswell and Creswell (2018) assert that in terms of methodology, researchers often validate knowledge claims based primarily on the constructivist perspectives like the multiple views of different participants with the intent of developing a pattern. This assertion is in line with the aim of this study. This study tries to understand the perspectives of the participants in social settings through interpretations without wanting to arrive at a predetermined outcome by interrogating theories. This is in line with the interpretive paradigm, since it will help explain the views of the teachers and students regarding the contextual and conceptual understanding of PSICT and TSICTSE without the researcher interrogating theories or making any inferences for them.

However, the level of PSICT and TSICTSE influence on TLICT component of this study employed the quantitative approach to determine PSICT and TSICTSE and the relationships between the dependent and independent variables involved. In this sense, the researcher relied on the positivist perspective to verify claims by measuring and analysing the relationships whilst using Pedagogical Support for ICT (PSICT) scale, Teaching and Learning of ICT (TLICT) scale and Computer-Self-Efficacy (CSE) instrument to solicit the teachers and students perspective on the phenomenon being studied.

Usually, the fundamental rule regarding the mixed research approach is that the mixture of the two-conformist qualitative and quantitative ways provides a lot of holistic and international understanding of a research problem than either approach alone (Creswell, 2015). The goal of the mixed method paradigm, however, is not a refutation of the qualitative or quantitative approaches, but rather attracts the positive and negative aspects of each in a single research study (Mayoh & Onwuegbuzie, 2014). With the utilisation of both quantitative and qualitative approaches, the researcher hopes to achieve a broader understanding of the matter that is being researched into instead of employing a single-method research approach. The strength of the mixed methods design approach makes it ideal for use in this study as the researcher intends to look at both the breadth and the width of the issue of PSICT and TSICTSE in teaching and learning of ICT (TLICT) in basic schools in Ghana.

The researcher's methodological position in this study is, thus, influenced by pragmatism research philosophy on epistemological and ontological underpinnings/ views of the nature of knowledge, social reality and method of enquiry. The researcher, coming from an academic background in Education and Management, believes that no single idea, theory, approach or method has been absolute to provide a complete explanation of any social phenomena. Instead, as asserted by Owusu-Mensah (2006), any theory, method or approach at least best adequately explains just an aspect of a phenomenon where others fail to explain. This implies that it is only a combination of different theories, approaches and methods that can provide a complete practical solution or explanation of a social problem/phenomenon. The researcher has therefore always favoured an eclectic approach in dealing with a social phenomenon.

4.3 Research Design

Research designs are procedures for collecting, analysing, interpreting and reporting data in research studies/investigations (Creswell, 2006). To fully achieve the purpose and objectives of the study, this research used mixed methods design, specifically the explanatory sequential design. This is a two-phase mixed method design in which quantitative data results are further examined in more details (explained, expanded or elaborated) through qualitative data results. Thus, its focus is on the quantitative results being examined in more details through the qualitative part of the study. This research design was employed in the study because the qualitative data will help explain or build upon the initial quantitative results obtained on the issue of PSICT and TSICTSE in TLICT in basic school as opined by Creswell (2006). In effect, this mixed methods design is more quantitative than qualitative. The literature reveals that several scholars have indicated that the mixed methods approach is self-contained and its application in scientific research is legitimate, owing to its popularity in social science studies (Teddlie & Tashakkori, 2010; Creswell, 2015; Creswell & Creswell, 2018).

What must be noted is that the wide expressed disadvantages of the mixed analysis strategies have continually needed the enquirer to own bound skills, time, and resources for intensive knowledge assortment and analysis (Creswell & Plano Clark, 2015). In addition, the scientist is anticipated to be aware of the main characteristics of conventional qualitative analysis, which include: induction, discovery, exploration, theory/hypothesis generation; and, quantitative research, which involves: deduction, confirmation, theory/hypothesis testing, clarification, prediction, standard knowledge assortment, and Applied Mathematics analysis (Johnson & Onwuegbuzie, 2014). To effectively use the mixed method, the researcher equipped himself with current

knowledge and skills on the two traditional paradigms, in order to overcome the anticipated challenges regarding the use of the philosophical underpinning in this educational research.

There are several research designs. This may include quantitative design, qualitative design, mixed method design and several others. However, there is proliferation of mixed methods design in the literature. Tashakkori and Teddlie (2003) claimed they had found nearly forty (40) different types of mixed method designs in the literature. Creswell, Plano Clark, et al. (2003) summarised the range of these classifications. Their summary has been updated into 12 classifications, according to Creswell (2006), and has span the past 15 years of scholarly writings about mixed method approaches. Creswell (2006), however, asserted that, there is actually more similarities than differences among these classifications, and to avoid confusion, based on the similarities, categorised mixed method design into four as: Explanatory Design (Explanatory Sequential Design), Exploratory Design, Triangulation Design, and Embedded Design. Creswell (2015) further summarised mixed method design into two main types, namely: explanatory and exploratory mixed method design.

Both the explanatory and exploratory mixed method designs involve a two-step project but with a different focus. The focus of the explanatory mixed method design is to use the qualitative approach to validate the quantitative results. The intent of the exploratory mixed method design, however, is to use the qualitative results of the first-phase to help develop the second phase of the quantitative method. With the explanatory mixed method design, the researcher, at the initial phase, gathers quantitative data, analyses, and applies the results to design and conduct the second, qualitative phase. The second design starts with collecting qualitative data to further examine and expand the quantitative study. The use of the exploratory mixed method

design becomes eminent for researchers under conditions where the measures or instruments for the study are not available, variables unknown, or there is no guiding framework or theory (Creswell, 2015).

In the current study, the explanatory sequential mixed method was used, first, because the variables (latent variables) that relates to pedagogical support were known from the review of the literature and informal interactions/interviews, and two, to enable the researcher use the qualitative approach to validate the quantitative part of the study, solely for triangulation purpose.

4.4 Population, Sample and Sampling Techniques

4.4.1 Population of the Study

All basic school ICT teachers and students in the 10 traditional regions in Ghana (Western, Central, Ashanti, Brong-Ahafo, Northern, Upper West, Eastern, Upper East, Volta, and Greater Accra) constitute the population (target population). All basic school ICT teachers and students in 10 districts from the 10 traditional regions in Ghana constitute the accessible population. The researcher purposively selected these 10 regions because they are the known traditional regions of Ghana and appear common and known by everyone, and sample drawn from these traditional regions for the study would be a true representative of the entire country to enable generalisation of the results. Of course, it is these 10 regions that some four regions (Volta, Northern, Brong-Ahafo, and Western) were sub-divided to create the new 16 regions. For this reason, it would be easy for readers of the report to associate with these regions, and samples drawn from the 10 old regions also reflects a nationwide survey/study, as the researcher intended.

4.4.2 Sample of the Study

Sample size is the subset of a population required to ensure that there is sufficient amount of information to draw conclusions (Sekaran & Bougie, 2010). Sample size determination or consideration is an important feature in any research whose goal is to make inference about the research population. The size of the research sample is decided by the researcher, depending on population size, research approach and design, the aim of the research, the analysis techniques, sample size used for similar studies, time and resources, population variability, model complexity or number of variables under consideration (Memon et al. 2020; Davis, Mengersen, Bennett, & Mazerolle, 2014; Hedeker, Gibbons, Waternaux, 1999). The study by Alreck and Settle (1985) suggested that a sample size of 10% will be representative enough for the entire population. Sample size should not be sufficiently large but not too small in order to obtain the needed data within the stipulated time at a minimum cost (Fraenkel & Wallen, 2000). In furtherance of the sample size determination struggle, Yildirim and Simsek (2006), suggested that, if parametric test will be deployed in the statistical analysis, then sample size of between thirty and five hundred will be appropriate; other than that, non-parametric statistical techniques can be used.

The researcher, bearing in mind these and many other issues regarding the appropriate sample size for a study, relied on the sample size table by Krejcie and Morgan (1970), which they presented based on the sample size formulae by the National Education Association (NEA, 1960), which takes into account reliability and population size to decide the appropriate sample size for this study.

The study sample size accommodated 600 participants, comprising of 300 ICT teachers and 300 students for the quantitative data; out of the estimated accessible population of 201,000 ICT teachers and students within the basic schools in 10 selected

districts. Study sample for the qualitative data was 20, consisting of 5 ICT teachers and 5 students for interview, a focus group discussion involving 5 ICT teachers and another involving 5 students. The overall sample size for the study is therefore, 620 out of the estimated total accessible population of 201,000 ICT teachers and students from basic schools in 10 districts across the 10 traditional regions of Ghana. This sample size (620), which is based on Krejcie and Morgan (1970) sample size table, is statistically appropriate for an estimated accessible population of 201,000. The study sample size provides 95% confidence level with 5% error margin.

A sample school was classified as urban, semi-urban or rural school. In this work, urban basic school is the one in a Metropolitan/Municipal/District capital. Semi-urban basic school is the one in a town other than the Metropolitan/Municipal/District capital but with evidence of availability of basic social amenities and facilities such as electricity, pipe-born water, a bank, a secondary school, a polyclinic/health center, a market sizeable enough, and with an estimated population of 1500 or more. The determination of rural basic school is based on the Ghana Education Service (GES) categorisation of basic schools' socio-economic status of parents – SES (MOE, 2018) - school location, estimated population of the town/village not exceeding 1500 and the absence of basic social amenities and facilities.

4.4.3 Sampling Techniques

The researcher used a multi-staged sampling technique to select the sample for the present study. First, the researcher selected the 10 traditional regions in Ghana for the study using the purposive sampling technique. The purpose was to ensure that the study covered the entire country based on the previous regional demarcation so that a degree of generalisation could be made.

Second, the researcher employed the simple random sampling technique to restrict the study to a district in each of the 10 traditional regions earmarked for the study (10 districts). The use of samples from urban, semi-urban and rural school in a district in each region was to ensure that data collected was not skewed towards a particular direction. It was also to ensure that all schools were fairly represented irrespective of the location.

Third, the simple random sampling technique was employed to select 30 basic schools from each district/municipal/metropolitan (10 urban, 10 semi-urban, and 10 rural schools), from which the actual teacher and student participants were selected for sample inclusion. Fourth, the stratified random sampling technique was used to select 300 teachers of ICT and 300 students from the 300 sample schools classified as urban, semi-urban and rural from the 10 districts for the quantitative study. Thus, an ICT teacher and a student each was selected randomly from 30 district schools classified into urban, semi-urban and rural.

In the fifth and final stage, the purposive sampling was used to select 20 participants for the qualitative data collection. The researcher picked 5 ICT teachers and 5 students from 5 basic schools in Sepaase, Abuakwa, Abuakwa-Maakro, Mim and Nirebehini in the Atwima Nwabiagya Municipal, which is the sample study district for the Ashanti Region for the interview. The five schools used for the interview were also used by the researcher to conduct the observational study out of convenience and in a way to also corroborate the responses of the interview. The researcher also gathered at one place (school), five teachers and five students who could speak good English from five different basic schools in Nkawie and Toase in the same Municipality for the focus group discussion. This multi-stage sampling procedure, as laid down helped in selecting

the right participants as well as a representative sample necessary to collect the right data to arrive at a reliable and valid conclusion of the study.

4.5 Instrumentation for Quantitative Study /Design

According to Leedy and Ormrod (2001) quantitative researchers seek explanations and predictions that will generate to other people and places. They further posit that the intent of quantitative research is to establish, confirm, or validate relationships and to develop generalisations that contribute to theory. Their position on quantitative research perfectly fits into the purpose of my study. In the case of this study, my intent was to determine or establish the level of PSICT and TSICTSE and their influence on teaching and learning of ICT (TLICT) through a quantitative study and further confirm and provide explanation to key results that emerge through a qualitative study. This intent led to the employment of sequential explanatory mixed method design, which first requires the conduct of quantitative study, followed by qualitative design to collect qualitative data. Thus, it was important and inevitable to self-develop as well as adapt an instrument to collect quantitative data.

A self-developed validated questionnaire for PSICT and TLICT and an adapted Computer Self-Efficacy (CSE) scale by Teo and Koh, (2010) were used to collect quantitative data to assess PSICT, TSICTSE and TLICT in schools (See Appendix B – Survey questionnaire). The questionnaire was put together by the researcher based on an extensive review of literature on the main variables and the objectives of the research as well as a review of related previous questionnaires on similar works and also through informal interactions/interviews with some ICT teachers and students. It is structured into 8 distinct sections labeled ‘A-H’, and the section ‘A’ contains items to collect

respondents' background information while the other sections contain items to solicit information on the main variables or constructs of the study.

Commented [WU3]: Describe the other Sections.

4.5.1 Pedagogical Support for ICT (PSICT)

Section 'B - E' of the questionnaire is designed to collect data on PSICT availability by looking at five dimensions or components of pedagogical support for ICT. Items in Section 'B' assess support for ICT infrastructure availability. Section 'C' relates to availability of ICT training for teachers and students. Items in Section 'D' collected information about availability of ICT teaching and learning resources and facilities in schools. Section 'E' of the questionnaire relates to incentives/motivation for teaching and learning of ICT in schools.

4.5.2 Teaching and Learning of ICT (TLICT)

For Sections F and G of the questionnaire, the items were designed by the researcher and assess the effectiveness of teaching and learning of ICT in schools. Section F specifically measures the effectiveness of teaching of ICT while Section G measures learning of ICT in schools.

4.5.3 Adapted CSE Scale by Teo & Koh (2010)

Section 'H', which is the final part of the questionnaire, is an adapted Computer Self-Efficacy (CSE) scale to assess teachers' and students' ICT self-efficacy in basic schools.

4.5.4 Initial Validation and Pilot Test of Questionnaire Instrument

The questionnaire instrument was thoroughly subjected to an initial reliability and validity test before it was finally used to collect the quantitative data from the participants. Content validity was ensured through an extensive review of literature on the main objectives and variables of the study. This ensured that all major issues in connection with the research objectives and the main variables of the study had been fully covered and captured in the questionnaire instrument. Construct validity of the questionnaire instrument was ensured by the researcher giving the preliminary questionnaire to colleagues on the Ph.D programme, expert researchers, senior lectures and professors in the area, as well as the researcher's co-supervisor and principal supervisor for their suggestions for necessary revision. In order to ensure the internal validity of the results, however, the researcher made sure that the respondents of the study were actual teachers and students from basic schools in Ghana to guarantee that the findings and conclusions of the study are not bias or misleading.

Content analysis of the initial items was done by a six-member panel of different background to determine the Item Content Validity Index (I-CVI) as well as the Scale Content Validity Index (S-CVI). From the analysis, 68 items were marked relevant out of 75 items and the I-CVI ranges from 0.50 to 1.0 (50 items had an I-CVI of 1.0, 11 items had an I-CVI of 0.86, 7 items had an I-CVI of 0.83, 2 items had an I-CVI of 0.68, and 5 items had an I-CVI of 0.50). The 7 items marked irrelevant were eliminated. The S-CVI/UA was 0.73 while the S-CVI/Ave was 0.96.

Initial reliability of the questionnaire was ascertained in a pilot test with 20 teachers and 20 students (40 participants) from 20 basic schools in the Kwadaso Municipality from 13th to 17th September, 2021. This Municipality was used because it was not one of the districts/municipals/metropolises selected for the study. The

internal consistency (reliability) was estimated through Cronbach Alpha Reliability test. The reliability of each research theme/construct/variable as well as the composite reliability of all the research variables (all items of the main theme on the questionnaire) were determined. The Cronbach Alpha reliability values recorded were all above 0.70 (See Table 4.1). The benchmark reliability coefficient threshold of 0.70 (Cronbach's, 1990) was used to confirm the internal reliability of the pilot questionnaire.

Table 4.1 Cronbach's Alpha Reliability Results of Pilot Test

CONSTRUCT	CRONBACH'S ALPHA	NO. OF ITEMS
ICT Infrastructure	.846	11
ICT Training	.967	5
Resource and Facility	.836	12
Incentive	.780	9
ICT Teaching	.976	10
ICT Learning	.892	11
ICT Self-Efficacy	.962	10
OVERALL SCALE	.881	68

Source: Pilot questionnaire Survey, Sept. 2021 N = 40

4.5.5 Validation of Questionnaire Data through EFA, CFA, GoFIs and

Correlation Analysis

The second phase of validation was the psychometric analysis of the actual/main data collected from the 600 participants to ascertain the reliability and validity of the data before being analysed to answer the research questions and test the research hypotheses. The statistical analysis performed were: Exploratory Factor Analysis (EFA); Confirmatory Factor Analysis (CFA); Goodness of Fit Indices (GoFIs), and Correlation Analysis (CA). An initial Exploratory Factor Analysis (EFA) and a further

Confirmatory Factor Analysis (CFA) tests were carried out to ascertain the robustness of the instrument. In the EFA, all factor loadings < 0.40 were removed from the analysis. Also, the researcher ensured items with cross-loadings were expunged. The CFA statistical fitness of measurement was used to evaluate the convergent scale validity and scale reliability. Reliability and validity tests were conducted. These include Cronbach's alpha test of reliability, construct reliability, convergent validity and average variance extracted. As presented by Cronbach (1990), a Cronbach's alpha of 0.70 is required to ensure internal reliability of instrument. This threshold was maintained in the study. The researcher also tested for the validity of the measurement scales. Validity means the extent each construct appropriately measures the characteristics, attributes or behaviour it intends to measure or assess (Kimberlin & Winterstein, 2008). The validity of the measurement scale was evaluated using convergent validity.

The following processes were undertaken to ensure convergent validity. First, the researcher ensured that the CFA items with poor loadings (< 0.50) were abandoned and not used or included in the analysis. Also, the researcher ensured items with cross-loading were expunged. Items whose responses failed to converge were also abandoned. There is convergence validity of the construct if the Average Variance Extracted (AVE) is >0.5 , and there is Construct Reliability (CR) if the CR value is >0.5 (Fornell & Lacker, 1981). Also, for a good construct, the significance level of T-values of the CFA should be >0.05 ; thus, greater than 5% ((Fornell & Lacker, 1981). Hensler et al. (2015) recommended AVE threshold of $\geq .50$ while Huck (2004), Taber (2018), Hensler (2012) recommended CR threshold of $\geq .70$. Hair et al. (2010) recommended a T-value threshold of 1.96. The researcher ensured all these significant thresholds were met before the data were analysed to answer the research questions and further test the

research hypotheses. (See the EFA and CFA results of the actual data in tables: 5.2, 5.3, 5.4, 5.5, 5.6, and 5.7).

Beyond the EFA and CFA was the Goodness of Fit Indices. For a good construct, the general requirement is that the Root Mean Standard Error of Approximation (RMSEA) should be equal to or less than 0.08 and the Comparative Fit Index (CFI) should be greater than or equal to 0.95; whereas the Standardised Mean square Residual (SRMR) must be less than 0.03. Furthermore, P-value of the chi-square value obtained should be more than 5% with the ratio of chi-square to its degrees of freedom (*d. f*) less than 5. (Fornell & Lacker, 1981). Kline (2013) recommended a CFI threshold of $\geq .70$. Kline (2016) recommended SRMR threshold of $\leq .08$ while Schreiber et al. (2006) recommended RMSEA threshold of $\leq .08$. All these thresholds were met (See Table 5.8).

Finally, on the validation process was the Correlation Analysis. The essence of Correlation test is to explore the level of association between the dependent variables and the independent variables and in a way to validate or invalidate the research hypothesis of a study. Kamasak (2011) asserts that a low moderate correlation among the explanatory variables is needed to ensure that they contribute distinctly and uniquely to the overall model. Similarly, Bhatti et al. (2012) explained that if the measure or degree of association between the explanatory variables is above 0.9, then there is the likelihood of multicollinearity occurring in the model. The Correlation Analysis of the data shows that this threshold was also met, and that there is no likelihood of multicollinearity occurring. (See Table 5.9).

4.6 Instrumentation for Qualitative Study

An interview, focus group discussion, and an observational guide were designed by the researcher to gather the qualitative data after the collection and analysis of the quantitative data (See Appendix C, D & E for these qualitative instruments). Thus, interviews, focus group discussions and observations were the main instruments to collect the qualitative data in the second phase of the data collection in the study.

4.6.1 Interviews

One of the second phase of the data collection was done through face-to-face interviews conducted by the researcher with the participants, having validated the protocols by some experts in qualitative research. The researcher employs the use of the teachers' and students' interviews protocols, having analysed teachers' and students' PSICT questionnaires surveyed to them. After the analysis of the quantitative data collected was complete, five teachers and five students were interviewed using a structured interview guide to corroborate the quantitative results. Structured interview guide was used because the interview needed to be structured to follow along or follow strictly the results/outcome of the quantitative study to confirm, corroborate, expand and provide explanations to key issues that emerged from the quantitative study. The interview concentrated on getting detailed information on the teachers and students views on the PSICT received and TSICTSE with respect to how it affects real teaching and learning of ICT in the school. Maiklad (2001) sees interviewing as the most often used methodology in qualitative analysis. It usually seems in teachers' beliefs and investigations as a foremost methodology. The aim of utilising the interviews actively was to permit the teachers and students to return and echo what they had been experiencing themselves regarding PSICT and their ICT self-efficacy in teaching and learning of ICT in the school. The question-and-answer technique within the interview

was important to help disclose the divergent and implied PSICT components and their related influence on practical teaching and learning of ICT as well as influence on TSICTSE in the school.

The researcher used an interview guide to help upgrade the fullness, thereby making the data collection systematic for all the respondents in the study. Moreover, with structured questions in mind, a planned focus in advanced style of interview afforded the researcher the opportunity to judiciously use the time as an interviewer.

4.6.2 Focus Group Discussion

This is one of the methods of collecting qualitative data that has gained popularity in social sciences, particularly in educational research (Hinne, 2012). It is a method that enables the researcher, acting as a moderator in the process (Bell, 2008; Denscombe, 2008), to bring a number of participants together at one convenient location at one time to assess their views/opinions, experiences and feelings about a phenomenon under study (Bell, 2008; Denscombe, 2008; Marvasti, 2004). According to Hinne (2012) for a more meaningful discussion, it is important that the group members are familiar with the issue being discussed. Accordingly, the focus group interview can be used when the participants have initially familiarised themselves with some issues through responses to other instruments such as questionnaire, exactly as was the case in this study.

Focus group discussion is particularly useful when the topic to explore is general, and the purpose is to either stimulate talk from multiple perspectives from the group participants so that the researcher can learn what range of views are, or to promote talk on a topic that informants might not be able to talk so thoughtfully about in individual interviews (Bogdan & Biklen, 2007). Thus, focus group discussion can

provide insight into issues which cannot be covered on a survey. The purpose of using focus group discussions in this study was to help investigate further the PSICT teachers and students receive in the school as well as their ICT self-efficacy for the teaching and learning of ICT to complement the data gathered through the survey questionnaire.

Two focus group sessions were conducted as part of this study, one for the ICT teachers and another for the students, all in sample schools in the Atwima Nwabiagya Municipality in the Ashanti Region. The sessions were used to probe further issues that emerged out of the responses of teachers and students from the survey questionnaire. This is in line with the view that one of the conditions for using focus groups interviews in research is when the researcher needs information in order to throw more light on quantitative data already collected (Kruger & Casey, 2000 cited in Owusu-Mensah, 2006).

For the purpose the researcher intended achieving with the focus group interview, the main issues that emerged from the quantitative data that needed further probe were the main issues that the researcher set out for the focus group discussion sessions with the teachers and students. The topics/questions were already written down in a focus group discussion guide and the researcher used it to moderate the interview/discussion sessions with the teachers and students.

4.6.3 Observation

Creswell (2015) thinks that observation can be inferred as a systematic and a clinical process of recording the behavioural patterns of participants, objects and occurrences without essentially communicating with them. Observation is an everyday activity in which we use our senses (seeing, hearing, touching, smelling, tasting) intuition to gather bits of data. Observation could also be viewed as the act of watching

behavioural patterns of people or things in certain situations in order to obtain information about the phenomenon of interest or under study (Johnson & Christensen, 2012). There are different forms of observation including participant and non-participant observation. The researcher used non-participant observation involving a checklist and rating scale to collect data on teacher and student ICT support for teaching and learning of the subject.

Creswell (2015) is credited to have identified and further listed four kinds of observation that could be applied in a qualitative study. First, non-participant observer is often viewed as a complete observer who looks at a situation from a distance, without direct contact per se. It is often therefore seen as the least obtrusive type of observation. The second is seen as a participant, as the observer gets involved in the situation and as such, in this situation, the observer does not influence the dynamics of the setting.

The third type of observation is the participant as observer. This is often applied in action research projects whereby the observer is actually viewed as being a part of research process. The researcher therefore is expected to work with the participants in the situation under observation and may intervene in the activity which sometimes makes attempts to change the entire settings under observation.

The final type is termed by Creswell as a complete participant with the observer totally immersed in the scenario such that those involved might not even notice that they are actually under observation or scrutiny in the first place.

The researcher operated as non-participant observer during data collection in this study. The researcher took the role of a non-participant observer while trying to investigate different basic school's situation by holding informal one-to-one observation with the individual ICT teachers and students and observing the ICT situation in the schools. The researcher strategically positioned himself in the classroom

Commented [WU4]: Were you dealing with only rural schools?

or school to take notes from the field to be able to describe the classroom or school activities using an observation guide. The researcher further explored how teachers' and students' use of various support materials in the teaching and learning process facilitates the teaching and learning of ICT or the lack of support materials retards the ICT lessons in the real classrooms and outdoor settings without interrupting the process in anyway.

4.7 Procedure for Data Collection

The procedure followed to collect both the quantitative and qualitative data is detailed as follows.

4.7.1 Questionnaire Administration

In this study, the researcher conducted the survey personally by administering questionnaires to 600 participants (ICT teachers and students) in 300 basic schools in 10 districts/municipals/metropolitans from the 10 traditional regions in Ghana. The districts/municipals/metropolitans are: Wasa-Amanfi District, Atwima Nwabiagya Municipal, Wenchi Municipal, Cape Coast Metropolitan, Yilo Krobo Municipal, Ningo-Prampam District, Tamale Metropolitan, Pusiga District, Jirapa Municipal, and Ho Municipal. The researcher opted for personal administration of questionnaires for its obvious anticipated advantages. As summarised by Osuala (1982), the researcher can establish rapport and explain the meaning of items that appeared unclear to respondents to understand exactly what the items mean so as to obtain the right responses. It was also the belief of the researcher that the administration of the instrument in person would result in more co-operation than if others were asked to collect the data. The researcher was also of the conviction that this means of collecting the data would offer him the opportunity to emphasise the importance of the study to

the respondents to ensure maximum response level. Owusu-Mensah (2006) also pointed out practical constraints that make the use of postal or mail and telephone questionnaires inappropriate for conducting a survey in developing countries such as Ghana.

As ethical issues are highly relevant and require due consideration in any research (Sarantakos, as cited in Akrofi, 2010), I had an obligation to follow all the laid down protocols of questionnaire administration in order to respect the rights, values and desires of all those who matter so far as the collection of the data was concerned. In line with these ethical issues, a letter of introduction from the Department of Educational Leadership, University of Education, Winneba was given to all the 10 District/Municipal/Metropolitan Directors of Education as well as Head teachers of the participating schools for their consent (See Appendix G – Introduction letter from Department). On presenting the introductory letter to each of the Directors of Education, their outfit issued to me a letter of permission to collect data (See Appendix I – Permission letter to collect Data) and printed a list of all basic schools under their jurisdiction and classified them into urban, semi-urban and rural school for me (See Sample of List in Appendix K – District list of schools and school categorization). This permission letter was then attached to the introduction letter from the department and presented to each school head that I visited. A covering letter to explain the purpose of the study and also to assure the respondents of their confidentiality and anonymity was attached to the questionnaire. To ensure the confidentiality of the respondents, the questionnaire did not require that respondents write their names, addresses, or phone numbers.

Practically, during the period of the data collection, the researcher would travel from Kumasi on Saturday or Sunday to spend the night in the district/

municipal/metropolitan capital targeted for data collection for the preceding week. On the average, a week was used to collect data in each district/ municipal/metropolitan and an average of 6 schools were visited a day. Per the researcher's plan, 10 urban schools (those in the district/municipal/metropolitan capital) were usually visited first for the data collection, followed by semi-urban schools and finally the rural schools.

I was usually present at the first school from Monday to Friday latest by 8:30 am for the data collection and close latest by 2:30 pm. In the school, my first point of call was the Head teacher's office to inform him/her about the intended exercise. The Head teacher would then get me an ICT teacher to assist me conduct the exercise. The ICT teacher also got me a student who could read and understand to respond to the questionnaire. The teacher and the student respond to the questionnaire simultaneously in my presence so that I could explain items that appear unclear to them. This process was repeated throughout the data collection process. The data collection started on the 11th of October, 2021 and ended on 17th December, 2021. The data collection started with the Yilo Krobo Municipal in the Eastern Region and ended with the Atwima Nwabiagya Municipality in the Ashanti Region.

The survey yielded a 100% response rate, primarily because of the personal administration of instrument. I ensured that, for each school I visited, the respondents complete the questionnaire for me before I left the school. Statistically, 600 questionnaires are adequate for a meaningful statistical analysis, since a minimum sample of 30 is considered a large sample size for statistical analysis (Cooper & Schindler, 2006).

Table 4.2: Schedule of Personal Administration of Questionnaires to Schools

DATE	DIST/MUN/METRO	NO. OF SCHS	NO
11 th – 16 th Oct, 2021	Yilo Krobo Municipal	30	60
18 th – 22 nd Oct. 2021	Ho Municipal	30	60
25 th - 29 th Oct. 2021	Ningo-Prampam District	30	60
1 st – 5 th Nov. 2021	Cape Coast Metropolitan	30	60
8 th – 12 th Nov. 2021	Wasa-Amenfi District	30	60
15 th -19 th Nov. 2021	Pusiga District	30	60
22 nd – 26 th Nov. 2021	Jirapa Municipal	30	60
29 th Nov.-3 rd Dec. 2021	Tamale Metropolitan	30	60
6 th -10 th Dec. 2021	Wenchi Municipal	30	60
13 th -17 th Dec. 2021	Atwima-Nwabiagya Municipal	30	60
	TOTAL	10	300
		300	600

4.7.2 Interview with Teachers and Students

As part of gathering the qualitative data, the researcher used structured interview guide to conduct a face-to-face interview with the ICT teachers and students in the schools from 31st January to 2nd February, 2022 (See Appendix C – Interview guide). The researcher made a visit to 5 schools to conduct the interview with five ICT teachers and five students in the Atwima Nwabiagya Municipality. The schools visited for the interview were in: Sepaase, Abuakwa, Abuakwa-Maakro, Mim, and Nirebehini.

Before the start of the interviews, I handed over to each interviewee a detailed description and outline of the study and all those to be involved were made to sign the ethics consent form. I further offered explanation to the teachers and students stipulating that participation was optional and they could withdraw before the interview took place or in the course of it. I conducted the teachers’ and the students’ interviews separately. Questions in the interview protocol were used to elicit more detailed information concerning PSICT and the influence on teaching and learning of ICT, and

TSICTSE in the school. Interviews with the students were conducted first and were followed with that of the teachers.

These interviews included extra questions when clarification was needed. Therefore, the interview was the most apt way to trigger the collection of data on teachers' and students' PSICT in the school and, for that matter, in the teaching and learning process of ICT. In brief, interviewing the teachers and students assisted me to illicit descriptive data in their own wordings and language as prescribed by Freeboby (2003), in order to properly investigate and appreciate their views on their pedagogical support situation. The interviews were recorded digitally using my Smart Android mobile phone. The data collected was transcribed using the clean transcript technique, as prescribed by Elliot (2010). In this case, unwanted words or sounds and animation were excluded. Eventually, in the final analysis, the transcripts were given back to the interviewees to be able to do the much-needed double checking of the exact meaning to be made and inferred from the transcribed data or information.

Commented [WU5]: Check the page setting

4.7.3 Focus Group Discussions with Teachers and Students

The second stage of collecting the qualitative data involved the use of a Focus Group Discussion Guide (FGDG) by the researcher to conduct focus group discussion sessions with the ICT teachers and students (See Appendix D - FGDG). At one place/school (Nkawie cluster of schools), the researcher gathered five ICT teachers and five students from five different schools (1 teacher and a student from a school in Toase and the rest from Nkawie cluster of schools) in the Atwima Nwabiagya Municipality of the Ashanti region. At the beginning of each session, the researcher introduced himself and explained the purpose of the study to the participants. The researcher again created the participants indulgence that; the data was being collected purely for

academic exercise. Further, the researcher made the participants understood that none of the information they would provide would be used against them in any way. This initial briefing was meant to ensure their cooperation and also to fulfill the researcher's ethical obligations. The researcher would then ask them to introduce themselves. Throughout the sessions with the teachers and students, the cooperation of the participants was ensured by observing all the protocols required of an effective focus group discussion. Each of the discussion sessions lasted for at least 20 minutes. The focus group discussion with the teachers and students took place on 3rd February, 2022.

4.7.4 Observation Study in the Schools

The researcher, through non-participant observation, made a visit to five schools in the Atwima Nwabiagya Municipality to observe for himself the phenomenon (ICT situation) in the schools. The researcher used an observational guide (check list and rating scale) to conduct the observational study (See Appendix E – Observation Study Check List). The observational study was conducted from 31st January to 2nd February 2022. The schools visited for the interview were the same schools in which the observational data was collected. The researcher during the study carefully observed the phenomenon of interest and ticked the appropriate response scale based on the check list.

4.8 Reliability and Validity of Data

The researcher ensured the data collected is both reliable and valid for use in the analysis.

4.8.1 Reliability of Quantitative Data

The scales' composite and items' internal reliabilities (Bagozzi, 1993; Hair, Black, Babin & Anderson, 2010) were examined. For the construct reliability (CR) and items internal consistency, CR and Cronbach's alpha ratios are required to meet the minimum threshold $\geq .70$ for social and behavioural science studies (Fornell & Larcker, 1981; Bagozzi, 1993; Hair et al., 2010). In accordance with practice, the scales' reliabilities were confirmed by comparing the results with those in previous studies. From the reliability tests run, all the reliability co-efficiencies recorded met the minimum threshold of 0.70 (See Table 5.8) required for statistical analysis.

Commented [WU6]: What need are the exact figures

4.8.2 Validity of Quantitative Data

Validity was examined for constructs' convergent and discriminant validity, following Fornell and Larcker (1981). Average Variance Explained (AVEs), the square roots of AVEs and maximum shared variance (MSVs) were computed, examined and compared, to assess the convergent and discriminant validity. For convergent and discriminant validity, Fornell & Larcker (1981) and Hair et al., (2010) recommend AVE values greater than or equal to .50, greater than MSV values, and the square root of AVEs greater than correlation coefficients among inter-factors. The data collected met all these validity thresholds (See Tables 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.9 5.10).

4.8.3 Credibility of Qualitative Data

According to Lincoln and Guba (1985) and Miles and Huberman (1994), the credibility of a qualitative data/research results depends on a 'yes' answer to these three fundamental questions: (a) Do conclusions make sense? (b) Do the conclusions adequately describe research participants' perspectives? And (c) Do conclusions

Commented [WU7]: There should be proper linkage

authentically represent the phenomena under study? All these questions can be answered 'yes' in this study. The researcher also depended on triangulation and member checks to enhance credibility. Presenting the results to participants during a concluding interview by the researcher also served as a method to enhance the credibility of the results of the qualitative study.

4.9 Data Analysis

Data analysis in the study took two forms: quantitative and qualitative analysis. The procedure used to analyse data is detailed as follows:

4.9.1 Analysis of Quantitative Data

The study used the computer application software SPSS 23.0 version and AMOS for the management and processing of the quantitative data. Both descriptive and inferential statistical analysis were performed. Descriptive analyses, such as frequency and percentage, were used to report the general information on the participants, and the mean and standard deviation statistics for the main variables in relation to the research questions. Inferential statistical analyses such as correlation, composite regression, mediation, and MANOVA analysis was performed to test the research hypotheses of the study.

Validity and reliability were established for convergent and discriminant validity, construct's composite reliability and Cronbach's alpha for items' internal consistency, with the use of Confirmatory Factor Analysis (CFA) through Structural Equation Modelling (SEM).

4.9.2 Analysis of Qualitative Data

The thematic analysis was used to make meaning out of the qualitative data in this study. Following Creswell and Creswell (2018), Merriam (2014), Bowen, Rose and Pilkington (2017) on qualitative data analysis, the steps below were followed in the current study religiously.

Step 1. Organisation and preparation of the data for analysis.

At this stage, the researcher transcribed the interviews, optically scanned the materials, typed the field notes, catalogued the visual materials, sorted and arranged the data into different themes, depending on the sources of information.

Step 2. Careful reading of the data

With the second step, the researcher critically read the data in order to collect the prevailing ideas to be communicated by the teachers and students, and their state of mind which predisposes to the information provided and to also reflect the overall themes likely to be generated. Useful and necessary questions probed included but not limited to the following. What general ideas were the teachers and students articulating? What is the tone of the teachers' and students' ideas? What is the impression of the depth, credibility and use of the information gathered? As often, the traditional practice whereby qualitative researchers write notes in margins of transcripts or observational field notes or start recording general thoughts about the data was done at this stage.

Step 3. Coding of data

This step captured data coding which is often defined as the process of organising the data by bracketing chunks or text or image segments and writing a word representing a category in the margins (Rossman & Rail, 2012). Thus, taking text data or picture gathered, segmenting sentences, paragraphs and images into categories, and

labelling those categories with a term, often based on the actual language of the participants (called an *in vivo* term).

In addition to these steps, the researcher, having reached the data saturation level, whereby no other themes could emerge and having subjected the final themes back to the respondents to validate them as the accurate representation of what actually transpired during the actual data collection, the final product was validated for a second opinion by other experts in the interpretative paradigm. Finally, the researcher transformed his analysis into an interpretable form of writing whilst using exact and compelling extract in the form of examples that can relate to the themes, research question, and relevant literature. The report also relayed the results of the analysis in a way that is expected to convince the reader of the merit and validity of the analysis produced. It therefore expanded beyond the mere boundary of description of just the themes and rather portray an analysis that is supported with empirical evidence that addressed the research questions in its entirety.

4.10 Ethical Issues

Ethical issues are a set of guiding principles that help, the researcher in carrying out ethical studies. This research was planned in line with the British Educational Research Association's [BERA] (2018) Ethical Guidelines for Educational Research, which has been adopted by many universities all over the world including the University of Education, Winneba. In line with these guidelines, this study addressed the following ethical issues:

4.10.1 Informed Consent

The principle of informed consent is considered as a standard feature of the procedure in social research (Homan, 2002). “It is the requirement that human subjects be informed of the nature and implications of research and that participation is voluntarily” (Homan: 24). Similarly, Bryman (2004) believes that the principle of informed consent means that prospective research participants should be given as much information as possible to enable them to make an informed decision about whether or not they wish to participate in the study.

In line with the above, the researcher in exploring the issue of PSICT, followed due process to seek the consent of the participants in the recruitment process. Having in mind the Helsinki declaration, consent letter concerning the information on the fundamental purpose of the study were sent to the district directors of education and head teachers of the sample districts and schools, and the teachers’ and students’ consent were obtained in a cover letter attached to the questionnaire, to ensure non-compulsory participation. Also, during the interview, the teacher participants/ interviewees were made to read and sign a consent form (See Appendix K – Consent Form). For the student interviewees, the researcher obtained the contact numbers of their parents and sought permission from them. This procedure for data collection was in line with the ethics and instructions of the ten sampled district directorates of education in the ten selected study regions in Ghana.

4.10.2 Confidentiality and Anonymity

It often has to do with the handling of the information concerning the respondents in a confidential manner. This aspect includes the principle of trust in which the researcher will assure the participants that their trust would not be exploited

for personal gains. The British Educational Research Association's (BERA) Ethical Guidelines for Educational Research (2018:7) state inter alia:

Researchers must recognise the participants' entitlement to privacy and must accord them their rights to confidentiality and anonymity, unless they or their guardians or responsible other specifically or willingly waive that right. In such circumstances it is the researcher's interest to have such a waiver in writing. Conversely, researchers must also recognise participants' right to be identified with any publication of the original works or other inputs, if they so wish. In some contexts, it will be the expectation of participants to be so identified.

In line with international best practices, the issue of confidentiality in respect of all the participants was addressed by keeping every bit of information they provided in the strictest secrecy. The participants who were involved in the questionnaire could not be identified because they were asked not to write their names or their phone numbers on the questionnaire with regard to the issue of anonymity. Further, only codes (pseudonyms) were used on interview transcripts during reporting of the findings and no references were made to the individual participants. The data was also reported in the aggregate.

4.11 Limitations of the Study

The use of self-reports data is usually seen as a subject of an overt embellishment, deceit, and fabrication or prejudice due to the varying socio-economic environment common in all the regions of Ghana. There is the possibility that participants can often misconstrue the research questions or intentionally forge them due to their inability to express their opinions, attitudes, values or perceptions (Creswell, 2015; Creswell & Creswell, 2018). It is possible that the responses of some participants might be miles away from the reality on the ground. Correspondingly, researcher partiality and its related effects during the observations and interviews can

Commented [WU8]:

Commented [WU9R8]: Incomplete sentence

probably influence participants' responses and, in this study, the teachers and students (Gay & Airasian, 2003).

Despite these possible limitations, this study presents realistic feedback or results for ensuring improvement in the provision of adequate and essential PSICT for the teaching and learning of ICT as well as TSICTSE in basic schools in Ghana, having the target of achieving the goals and objectives of ICT education at the basic level.

CHAPTER FIVE

DATA ANALYSIS, PRESENTATION AND DISCUSSION OF RESULTS

This chapter, essentially aims to provide insight into the PSICT available as well as TSICTSE, and their influence in the teaching and learning of ICT in basic schools in Ghana through a comprehensive analysis of data, presentation and discussion of the results of the study. The focus is on ascertaining the level of PSICT available for the teaching and learning of the ICT programme, the effectiveness of teaching and learning of the ICT subject, teachers' and students' ICT self-efficacy, influence of PSICT on TLICT, influence of PSICT on TSICTSE, TSICTSE influence on TLICT, the mediating role of TSICTSE in the relationship between PSICT and TLICT, and finally, whether or not there is significant difference between PSICT received by primary and junior high schools in Ghana. The result is presented first, followed by the discussion.

5.1 Respondents' Characteristics or Profile

The general profile of the respondents (basic school ICT teachers and students) who participated in the questionnaire survey is summarised in Table 5.1. The survey participants consisted of 300 ICT teachers and 300 students (50% each). This means that there was equal number of teacher and student participants in the study. Out of the 600 participants, 181(30.2%) and 419(69.8%) were primary school and junior high school (JHS) ICT teachers and students respectively, which means that teacher and student participants from the JHS outnumbered that of the primary school a little over twice. Also, an equal number 60(10%) of the participants were drawn from 10 regions and a district/municipal/metropolitan each (Western [Wasa-Amanfi District], Central [Cape Coast Metropolitan], Ashanti [Atwima Nwabiagya Municipal], Bono [Wenchi Municipal], Northern [Tamale Metropolitan], Upper West [Jirapa Municipal], Eastern

[Yilo Krobo Municipal], Upper East [Pusiga District], Volta [Ho Municipal] and Greater Accra [Ningo-Prampram District]). In terms of gender distribution, the male teacher and student participants were slightly higher – 306 (51%) - than their female counterparts – 294 (49%). With respect to age distribution, however, 300 (50%) of the respondents aged 11 to 20 years, 101 (16.8%) aged 21 to 30 years, 193 (32.2%) aged 31 to 40 years and 6 (1.0%) aged 41 to 50 years. There is the likelihood that the 50% of the participants who aged 11 to 20 years are students and the other 50% who aged 21 to 50 years are teachers. The majority 316 (52.7%) of the participants surveyed have also been in the school as teacher or student for 3 years and below. However, a significant minority 284 (47.3%) have also been in the school for more than 3 years. This means the participants have been in the school for quite a long period of time and were deemed fit to respond to the questionnaire items appropriately because they are presumed to have a fair knowledge or information about the topic being investigated.

Table 5.1 Background Information of Respondents

Respondents' characteristics	Category	<i>N</i>	%
Type of Respondent	ICT Teacher	300	50
	ICT Student	300	50
Basic School	Primary	181	30.2
	JHS	419	69.8
Region of School	Western	60	10
	Central	60	10
	Ashanti	60	10
	Bono	60	10
	Northern	60	10
	Upper West	60	10
	Eastern	60	10
	Upper East	60	10
	Volta	60	10
	Greater Accra	60	10
District/Municipal/Metropolitan	Wasa-Amanfi District	60	10
	Cape Coast Metropolitan	60	10
	Atwima Nwabiagya Muni.	60	10
	Wenchi Municipal	60	10
	Tamale Metropolitan	60	10
	Jirapa Municipal	60	10
	Yilo Krobo Muni.	60	10
	Pusiga District	60	10
	Ho Municipal	60	10
	Ningo-Prampram District	60	10
Gender	Male	306	51
	Female	294	49
Age Group	11 – 20	300	50
	21 – 30	101	16.8
	31 – 40	193	32.2
	41 – 50	6	1.0
Years spent in the school	3 and below	316	52.7
	4 – 6	160	26.7
	7 – 9	110	18.3
	10 and above	14	2.3

Source: Data from questionnaire survey, 2021 N=600

5.2 Reliability and Validity Test

In order to ensure that the data are robust and fit for the analysis to answer the research questions and further test the research hypotheses, several reliability and validity tests were carried out using the SPSS 23 version and AMOS. These included: Exploratory Factor Analysis (EFA); Confirmatory Factor Analysis (CFA); Cronbach's Alpha Reliability Test; Goodness of Fit Indices (GoFIs); and Correlation Analysis.

5.2.1 Exploratory Factor Analysis (EFA) of Scale Measures

To ascertain the reliability and validity of the data for the actual analysis to answer the research questions and test the research hypothesis of the study, an initial scale refining process was undertaken through an Exploratory Factor Analysis (EFA) to check the loadings of the measures/items against the variables of interest. The purpose of the EFA was to identify items of the scale that are principal component measure of the variables of the study and those not. All items with loadings below 0.40 (40%) were removed from the analysis. Similarly, items with cross-loadings were also not included in the analysis, except where the difference between the two loadings is 0.20 or greater, in which case the component with the higher loading is considered.

Table 5.2 Exploratory Factor Analysis (EFA) of Measures of Pedagogical Support for ICT (PSICT)

Sch. ICT Support	Item	Factor Loading
Ict. Infrastructure	i8	.746
	i9	.887
	i10	.890
	i11	.917
	i12	.551
	i13	.752
	i14	.489
	i15	.524
Training	i17	.772
	tr19	.985
	tr20	.985
	tr21	.946
	tr22	.985
Facility	tr23	.832
	f24	.940
	f25	.930
	f26	.876
Resource	f33	.860
	r27	.757
	r28	.485
	r30	.728
	r31	.894
	r32	.922
Incentive	r34	.590
	in38	.817
	in39	.832
	in40	.751
	in41	.641
	in42	.851
	in46	.580

Source: Data obtained from questionnaire survey, 2021

From Table 5.2, an initial 39 items were designed to measure Pedagogical Support for ICT (PSICT) under five components/dimensions (ICT Infrastructure [i];

Training [tr]; Facility [f]; Resource for teaching and learning [r]; and Incentive [in]. After subjecting the items to the EFA test, in the final analysis, 30 of the items were sustained with 9 items removed. An initial 11 items (i8 – i18) were designed to measure ICT infrastructure component of PSICT. After running the EFA test, items i16 and i18 were removed because they cross-loaded. All 5 items (tr19 – tr23) designed to measure training component were sustained after the EFA test. Twelve items (f/r24 – f/r35) were prepared to measure Facility ‘f’, or Resource for teaching and learning ‘r’ components. After the EFA test, items f/r24, f/r25, f/r26 and f/r33 were found to measure Facility component; hence, f24, f25, f26 and f33. Items f/r27, f/r28, f/r30, f/r31, f/r32 and f/r34 measure resource for teaching and learning; hence, r27, r28, r30, r31, r32, r34. Two items (f/r29, f/r35) were expunged because of cross-loading. Nine items (in38-in46) were intended to measure the incentive component of PSICT. After the EFA test, 6 of the items were sustained with in43, in44 and in45 removed because of cross-loading. See the full list of items removed and items sustained to measure PSICT after the EFA test in (Appendix B – Survey questionnaire).

Table 5.3 Exploratory Factor Analysis (EFA) of Measures of ICT Teaching and Learning

Variable	Item	Factor Loading	
Teaching	t51	.711	
	t52	.793	
	t53	.767	
	t54	.748	
	t55	.800	
	t56	.784	
	t58	.501	
	t59	.699	
	t60	.833	
	t61	.845	
	t62	.688	
	Learning	l63	.866
		l64	.882
l65		.735	
l66		.792	
l67		.794	
l69		.722	
l71		.780	
l72		.763	
l73		.639	
l74		.736	

Source: Data obtained from questionnaire survey, 2021

From Table 5.3, an initial 21 items were designed to measure the ICT teaching and learning (ICTTL) construct. After subjecting the items to the EFA test, in the final analysis, all 21 of the items were sustained. See the full list of items removed and items sustained to measure the ICT teaching and learning construct after the EFA test (See Appendix B – Survey questionnaire).

Table 5.4 Exploratory Factor Analysis (EFA) Loading of Measures of Teachers' and Students' ICT Self-Efficacy

Variable	Item	Factor Loading
Self-Efficacy	se76	.697
	se77	.846
	se78	.811
	se79	.748
	se80	.714
	se81	.767
	se82	.715
	se83	.740
	se84	.763
	se85	.779

Source: Data obtained from questionnaire survey, 2021

Table 5.4 shows that all the 10 items adapted from Teo and Koh (2010) to measure teachers' and students' ICT self-efficacy were sustained after EFA test because all the factor loadings were greater than the 0.40 threshold. See the full list of items sustained to measure teachers and students ICT self-efficacy after the EFA test (See Appendix B – Survey questionnaire).

5.2.2 Confirmatory Factor Analysis (CFA)

In an attempt to examine the relationship between the variables, a model refining process was undertaken to further ensure the robustness of scales while assessing how valid and reliable the scales are. Statistical fitness of measurement scale was evaluated in reference to scale reliability and construct validity using the Confirmatory Factor Analysis (CFA) through Variance-Based Structural Equation Modelling to check discriminant validity. Reliability and validity tests were conducted. These include Cronbach's alpha test of reliability, construct/composite reliability (CR), convergent validity/factor loadings/item estimates and average variance extracted (AVE). A Cronbach's alpha of 0.70 is needed to ensure internal consistency (reliability)

of items of a construct in a research instrument (Cronbach's, 1990; Hair et al., 2006; Hair, Sarstedt, & Ringle, 2012; Henseler, Ringle, & Sinkovics, 2009). Hair et al. (2010) explained reliability as an assessment of the degree of consistency between multiple measurements of a variable. As a result, the researcher assesses the internal consistency of the entire scale with Cronbach's alpha and overall reliability of each component/latent variable of PSICT, TLICT and TSICTSE values. From Tables 5.5, 5.6, and 5.7, the results show that the Cronbach's alpha coefficient for each construct/latent variable exceeded the 0.70 threshold. The Cronbach's alpha value for the entire scale, as indicated in the Cronbach's alpha summary (Table 5.8), also exceeded the 0.70 minimum threshold. The Cronbach's alpha values all exceeding the 0.70 threshold is an indication of the extent of internal consistency of the instrument.

The researcher also tested for the validity of the measurement scales. Validity refers to the extent to which each construct measured what it intended to measure (See Kimberlin and Winterstein, 2008). Variance-based structural equation modelling (SEM) is growing in popularity in recent developments and discussions (Henseler et al. 2014; Lu, Kwan, Thomas, & Cedzynski, 2011; Rigdon, 2014), and frequently applied across disciplines (Hair, Sarstedt, Ringle, & Mena, 2012; Lee, Petter, Fayard, & Robinson, 2011; Peng & Lai, 2012; Ringle et al., 2012). Variance-based SEM methods, such as partial least squares path modelling (PLS; Lohmoller 1989; Wold, 1982), generalised structured component analysis (GSCA; Henseler, 2012; Hwang and Takane 2004), regularised canonical correlation analysis (Tenenhaus & Tenenhaus, 2011), and best fitting proper indices (Dijkstra and Henseler 2011) all have in common or agree on the employment of linear composites of observed variables as proxies for latent variables, in order to estimate model relationship. The estimated strength of these relationships, most notably between the latent variables, can only be meaningfully

interpreted if construct validity is established (Peter & Churchill, 1986). The researcher, thereby, ensured that the measurement model scales in the study captured what was intended to be measured as posited by Campbell and Fiske (1959).

The validity of the measurement scales was evaluated using convergent validity. A convergent validity or factor loading/estimate value of 0.50 threshold was established to be accepted in the CFA test. Convergent validity is needed to confirm that the responses of the item converge, hence the item/measure is valid. There is further proof of construct validity if the Average Variance Extracted (AVE) is > 0.5 and also the Construct/Composite Reliability (CR) value is ≥ 0.5 (Fornell & Lacker, 1981). A threshold of ≥ 0.7 value of Construct Reliability (CR) is, however, recommended by Huck (2004), Taber (2018), and Hensler et al. (2012). Also, for a good construct, the significance level of T-values of the CFA should be > 0.05 ; thus, greater than 5%. (Fornell & Lacker, 1981). Hair et al. (2010) also recommended a T-value threshold of ≥ 1.96 .

As again shown in Tables 5.5, 5.6 and 5.7, the estimates of each observed variable/item factor loadings were above the 0.50 threshold. The T-values of the CFA of all the latent variables were all greater than 0.05 ($> .05$) as recommended by (Fornell & Lacker, 1981) and also by Hair et al. (2010). The Average Variance Extracted (AVE) values were all greater than 0.5 and Construct Reliability (CR) values greater than 0.5 as recommended by Fornell and Lacker (1981) and again greater than the 0.7 recommended by Hensler et al. (2012); Huck (2004); and Taber (2018). These statistics from the CFA results show that the two measurement instruments are both reliable and valid. They are acceptable.

Table 5.5 Reliability and Validity of Pedagogical Support for ICT Components through Confirmatory Factor Analysis (CFA)

PSICT Constructs	Item	Factor Loading	T-Values	Cronbach's α	AVE	CR
Ict. Infrastructure	i8	.8045023	43.17	0.864	0.708	0.879
	i10	.8124805	44.38			
	i11	.9036998	59.27			
Training	tr21	.9591071	120.43	0.903	0.810	0.786
	tr22	.9457016	113.14			
	tr23	.7856058	46.98			
Facility	f24	.8838796	80.19	0.920	0.824	0.933
	f25	.9868928	135.34			
	f26	.8470674	64.71			
Resource	r31	.8686436	39.17	0.787	0.643	0.838
	r32	.9387553	43.10			
	r34	.5426718	16.86			
Incentive	in38	.9961292	73.70	0.795	0.713	0.889
	In40	.7148412	32.21			
	in42	.8304521	48.98			

Source: Data obtained from questionnaire survey, 2021

Table 5.6 Reliability and Validity of Teaching and Learning of ICT Construct through Confirmatory Factor Analysis (CFA)

Variable	Item	Factor Loading	T-Values	Cronbach's α	AVE	CR
Teaching & Learning	t52	.875888	59.14	0.8784	0.732	0.858
	t54	.9420031	59.14			
	t55	.7355389	34.98			
	l64	.8392416	50.19			
	l69	.9275571	66.25			
	l72	.7746084	39.70			

Source: Data from questionnaire survey, 2021

Table: 5.7 Reliability and Validity of Teachers' and Students' ICT Self-Efficacy Construct through Confirmatory Factor Analysis (CFA)

Variable	Item	Factor Loading	T-Values	Cronbach's α	AVE	CR
Self-Efficacy	se76	.7570095	40.22	0.8718	0.684	0.894
	se77	.9386325	106.76			
	se78	.9391228	107.15			
	se79	.6314688	24.42			

Source: Data from questionnaire survey, 2021

Table 5.8 Summary of Cronbach's Alpha Reliability of Scale Constructs of Main Data

CONSTRUCT	CRONBACH'S ALPHA	NO OF ITEMS	DECISION/REMARKS
ICT Infrastructure	0.8640	3	Reliable
ICT Training	0.9039	3	Reliable
Facility	0.9203	3	Reliable
Resource	0.7870	3	Reliable
Incentive	0.7946	3	Reliable
Teaching & Learning ICT	0.8784	6	Reliable
ICT Self-Efficacy	0.8718	4	Reliable
OVERALL SCALE	0.8623	25	Reliable

Source: Data from questionnaire survey, 2021

Table 5.8 gives the summary of the Cronbach's alpha reliability coefficients for each of the component variables/constructs and the entire scale. From the results, both the variables and the entire scale coefficients meet/satisfy the recommended

0.70 minimum threshold of reliability. This is an indication that the scale used to assess PSICT, TSICTSE, and TLICT is reliable, as already stated in the previous section.

5.2.3 Goodness of Fit Indices (GoFIs)

For a good construct, the general requirement is that RMSEA should be less than 0.08 and CFI should be greater than or equal to 0.95; whereas SRMR must be less than 0.03. Furthermore, p-value of the chi-square value obtained should be more than 5% with the ratio of chi-square to its degrees of freedom (*d. f*) less than 5.

Table 5.9 Goodness of Fit Indices (GoFIs) of Constructs/Variables

Constructs/Variables	χ^2	(d. f.)	$\chi^2/d.f$	P	CFI	RMSEA	SRMR
ICT Infrastructure	0.000	956.96	0	1.000	1.000	0.000	0.000
Training	0.000	1569.57	0	1.000	1.000	0.000	0.000
Facility	0.000	1581.75	0	1.000	1.000	0.000	0.000
Resource	0.000	790.53	0	1.000	1.000	0.000	0.000
Incentive	0.000	1116.30	0	1.000	1.000	0.000	0.000
Teach. & Learn. ICT	0.000	1096.90	0	1.000	1.000	0.000	0.000
ICT Self-Efficacy	3.872	1648.84	0	0.8591	0.999	0.039	0.008

χ^2 = Chi-square d.f.= Degree of freedom; $\chi^2/d. f$ = normed Chi-square; RMSEA = Root mean standard error of approximation; CFI=Comparative fit index; SRMR = Standardised mean square residual

Source: Data from questionnaire survey, 2021

Table 5.9 above shows the model fit indices obtained after the CFA purification process. As has been explained from the previous section, for a good construct, the general requirement is that the root mean standard error of approximation (RMSEA) should be less than 0.08 and the comparative fit index (CFI) should be greater than or equal to 0.95; whereas the standardised mean square residual (SRMR) must be less than 0.03. Furthermore, p-value of the chi-square value obtained should be more than 5%

(.05) with the ratio of chi-square to its degrees of freedom (*d. f*) less than 5. The attainment of these thresholds as presented in the table suggests the achievement of strong convergent validity. As shown above, all the model fit indices for the principal constructs/latent variables (ICT Infrastructure, Training, Facility, Resource, Incentive, Teaching and Learning, ICT Self-Efficacy) were satisfactory and within the recommended range which demonstrates that strong convergent validity has been achieved for all the latent variables/constructs. It is, thus, concluded that the survey instrument is both reliable and valid (see Newson, 2015).

5.2.4 Correlation Analysis

This section presents the correlation statistics. After attaining validity and reliability statistics, the researcher went further to explore the relationship between the variables. The essence of correlation test is to explore the level of association between the dependent variables and the independent variables and in a way to validate or invalidate the research hypothesis of this work. Kamasak (2011) asserts that a low moderate correlation among the explanatory variables is needed to ensure that they contribute distinctly and uniquely to the overall model. Similarly, Bhatti et al. (2012) explained that if the measure or degree of association between the explanatory variables is above 0.9, then there is the likelihood of multicollinearity occurring in the model. As shown in table 5.10 below, the association among the independent variables is less than 0.9, indicating there is not the likelihood of multicollinearity occurring in the model.

Furthermore, from table 5.10, the correlation analysis shows a positive association between TLICT: and TSICTSE (.188**); and Incentive (.131**); and Resources (.322**); and Facility (.195**); and Training (.110**); and ICT Infrastructure (.066); and PSICT (.619).

The results also show a positive association between ICT Self-efficacy: and Incentive (.202**); and Resource (.081**); and Facility (.370**); and Training (.212**); and ICT Infrastructure (.147**); and PSICT (.684**).

Table 5.10 Correlation Analysis between the dependent and independent variables of the study

	TLICT	TSICTSE	INC	RES	FAC	TRA	INFR	PSICT
TLICT	1							
TSICTSE	.188**	1						
INC	.131**	.202**	1					
RES	.322**	.081**	-.145**	1				
FAC	.195**	.370**	-.159**	.085**	1			
TRA	.110**	.212**	.427**	-.507**	-.020**	1		
INFR	.066**	.147**	.215**	-.160**	.158**	.325**	1	
PSICT	.619**	.684**	.367**	.312**	.551**	.228**	.438**	1

TLICT=Teaching and Learning of ICT; TSICTSE= Teachers' and Students' ICT Self-efficacy; INC=Incentive; RES=Resources; FAC=Facility; TRA=Training; INFR=Infrastructure; PSICT = Pedagogical Support for ICT

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: Data from questionnaire survey, 2021

5.3 Components of Pedagogical Support for ICT (PSICT)

There emerges the need to assess pedagogical support for ICT available for the teaching and learning of ICT in basic schools in Ghana because it appears such a study has not been carried out since the introduction of the programme/curriculum in 2007. Therefore, no one seems to know empirically, the PSICT needs and their availability for the teaching and learning of ICT in the basic school. The need to assess PSICT needs and their availability for the teaching and learning of ICT, however, required that

the components of what constitute PSICT is known and a robust scale available for a comprehensive assessment of the construct. After an extensive review of the literature, it appears there is no existing scale to previously assess the PSICT construct, and the dimensions or components of the construct also appear to have not been established. Indeed, previous studies seem to have not focus on assessing PSICT as well as its dimensions elsewhere or in Ghana. Since this topic appears to have not been investigated before in any context and the non-existent of a scale to adopt or adapt to assess PSICT in the context of basic schools in Ghana, the researcher, through a comprehensive review of the related literature and experts' opinion in the field, self-developed a questionnaire instrument and validated it to assess the PSICT. Table 5.11 presents the components of PSICT through Structural Equation Modelling (SEM).

Table 5.11 Structural Equation Modeling (SEM) of Components of PSICT to the Overall PSICT Construct.

Structural PSICT	OIM					
	Coef.	Std.Err.	Z	P> z	[95%Conf.	Interval]
INFR	.11	.00	12.18	0.00	.09	.12
TRA	.18	.02	8.80	0.00	.14	.22
FAC	.22	.01	24.15	0.00	.23	.21
RES	.21	.01	19.77	0.00	.19	.23
INC	.23	.01	15.02	0.00	.20	.26
Cons	1.0	.07	15.99	0.00	.94	.94
var (e. PSICT)	.03	.00			.03	1.2

LR test of model vs. saturated: $\chi^2(0 = 0.00, \text{Prob} > \chi^2 = \text{estat gof, stats(all)})$

Source: Data from questionnaire survey, 2021

Table 5.11 is the Structural Equation Modelling showing the model components/dimensions of PSICT or areas of PSICT needs in the basic school for ICT teaching and learning. From the table, the co-efficiencies show that there is a positive relationship between all the latent variables/components and PSICT and the relationships were all highly significant (P-Values = 0.00; i.e P < .05). To explain further, ICT Infrastructure has positive relationship with PSICT (.11) and significant at P = 0.00 (P < .05). ICT Training positively relates to PSICT (.18) and significant at P = 0.00 (P < .05). The relationship between school facilities and PSICT is also positive (.22) and significant P = 0.00 (P < .05). The relationship between school resource for teaching and learning and PSICT, and between incentive for teaching and learning of ICT and PSICT are no different from the former variables, as both showed a positive relationship (.21; .23) respectively and all significant at P = 0.00 (P < .05). What these statistics imply is that ISESCT infrastructure, ICT training, School facility, School resource for teaching and learning, and incentive for ICT teaching and learning are significant components/dimensions of PSICT in the basic school; hence, they are areas of pedagogical support for ICT needs or areas that pedagogical support for ICT is required in the implementation (teaching and learning) of the ICT curriculum programme. The table further shows the estimates of each of the components to the overall PSICT construct model. From the table, ICT infrastructure contributes 11% to the overall PSICT construct model; ICT training 18%; Facility 22%; Resource for teaching and learning 21% and incentive for ICT teaching and learning 23%. This model presents a 95% confidence level with 5% margin of error.

5.4 Answering the Research Questions and Testing the Research Hypotheses of the Study

In order to answer the research questions and test the research hypotheses to achieve the objectives of this study, a questionnaire instrument of 75 items was developed. Sixty-eight (68) of the items which were designed to measure the main constructs of the study: PSICT, TSICTSE, and TLICT were validated.

The questionnaire was administered to 600 respondents comprising 300 basic school students and 300 teachers of ICT from 10 districts across 10 regions of Ghana. The data obtained from the questionnaire survey was subjected to reliability and validity test through an initial Exploratory Factor Analysis (EFA) and a further Confirmatory Factor Analysis (CFA) using Variance-Based Structural Equation Modelling (SEM) to check discriminant validity. Goodness of Fit Indices (GoFIs) of the main constructs were computed and the correlation among the constructs also examined. At the end of the reliability and validity tests, fifteen (15) of the items set out to measure PSICT and its components were sustained, six (6) items were sustained to measure TLICT and 4 items sustained to measure TSICTSE. See reliability and validity test results in Tables 5.2, 5.3, 5.4, 5.5 5.6, 5.7, 5.8, 5.9, & 5.10. From the review of related literature, experts recommend that, at least, a minimum of three (3) items is appropriate to measure a construct or variable/subscale factor (Carpenter, 2018).

The results of these robust tests, as presented in the mentioned tables, indicate that twenty-five (25) of the questionnaire items were reliable and valid (converged); hence, responses of these items were analysed to answer the research questions and also test the research hypotheses. The data was analysed using descriptive and inferential statistics and the results presented in figures and tables in the order of the research questions and the research hypotheses. Qualitative instruments were designed based on

the results of the quantitative study and analysed to further confirm, elaborate and provide key explanation to clarify some of the quantitative results.

5.4.1 Pedagogical Support for ICT Teaching and Learning

Research Question 1: To what extent is pedagogical support for ICT available in teaching and learning of ICT in basic schools in Ghana?

Table 5.12 Availability of Pedagogical Support for ICT in Teaching and Learning of ICT in Basic Schools in Ghana

ITEMS/SUBSCALES	Strongly Disagree	Disagree	Not Certain	Agree	Strongly Agree	MEAN	S.D
There is computer laboratory in the school.	388 (64.6%)	130 (21.7%)	0 (0%)	82 (13.7%)	0 (0%)	1.62	1.02
There are adequate computers in the school.	460 (76.7%)	99 (16.5%)	0 (0%)	21 (3.5%)	20 (3.3%)	1.40	.92
Computers are installed with enough application software or programmes.	429 (71.5%)	80 (13.3%)	0 (0%)	14 (2.2%)	77 (13.0%)	1.71	1.37
<i>ICT Infrastructure Component</i>	<i>1,277 (70.9%)</i>	<i>309 (17.2%)</i>	<i>0 (0%)</i>	<i>117 (6.5%)</i>	<i>97 (5.4%)</i>	<i>1.62</i>	<i>1.02</i>
You receive support to participate in ICT seminars.	525 (87.5%)	38 (6.3%)	9 (1.5%)	28 (4.7%)	0 (0%)	1.23	.70
You receive support to participate in ICT conferences.	525 (87.5%)	52 (8.7%)	9 (1.5%)	14 (2.3%)	0 (0%)	1.18	.56
You receive support to participate in ICT workshops.	525 (87.5%)	52 (8.7%)	9 (1.5%)	14 (2.3%)	0 (0%)	1.11	.39
<i>ICT Training Component</i>	<i>1,575 (87.5%)</i>	<i>142 (7.9%)</i>	<i>27 (1.5%)</i>	<i>56 (3.1%)</i>	<i>0 (0%)</i>	<i>1.19</i>	<i>.53</i>
Availability of classroom for ICT lessons	33 (5.5%)	0 (0%)	0 (0%)	348 (58.0%)	219 (36.5%)	4.20	.90

Adequacy of classroom for ICT lessons	33 (5.5%)	15 (2.5%)	38 (6.3%)	361 (60.2%)	153 (25.5%)	3.97	.95
Availability of tables and chairs in classrooms for ICT lessons	33 (5.5%)	100 (16.7%)	1 (0.2%)	59 (43.1%)	207 (34.5%)	3.84	1.22
<i>Facility Component</i>	99 (5.5%)	115 (6.4%)	39 (2.2%)	968 (53.8%)	579 (32.2%)	3.94	.96
Provision of notebook for ICT notes	28 (4.6%)	34 (5.7%)	27 (4.5%)	249 (41.5%)	262 (43.7%)	4.11	1.08
Provision of exercise book for students ICT exercises	0 (0%)	34 (5.7%)	28 (4.7%)	192 (32.0%)	346 (57.7%)	4.37	.82
Provision of writing materials – pen, pencil, chalk, board marker.	34 (5.7%)	20 (3.3%)	0 (0%)	88 (14.7)	458 (76.3%)	3.91	1.33
<i>Teaching & Learning Resource Component</i>	62 (3.4%)	88 (4.9%)	55 (3.1%)	529 (29.4%)	1,066 (59.2%)	4.14	.92
There is in place award/prize for best ICT teachers in the school.	472 (78.7%)	85 (14.2%)	43 (7.1%)	0 (0%)	0 (0%)	1.28	.59
Government pays special allowance to teachers who teach ICT in the school.	515 (85.8%)	85 (14.2%)	0 (0%)	0 (0%)	0 (0%)	1.14	.34
ICT teachers in the school are provided with laptop to motivate them teach.	383 (63.8%)	97 (16.2%)	54 (9.0%)	66 (11.0%)	0 (0%)	1.67	1.07
<i>Incentive Component</i>	1,370 (76.1%)	267 (14.8%)	97 (5.4)	66 (3.7%)	0 (0%)	1.39	.61
PSICT IN TEACH. & LEARN. OF ICT	4,383 (48.7%)	921 (10.23%)	218 (2.42%)	1,736 (19.3%)	1,742 (19.35%)	2.48	.80

Scale: (1= Strongly Disagree, 2 = Disagree, 3 = Not Certain, 4 = Agree, 5 = Strongly Agree). N = 600

Source: Data from questionnaire survey, 2021

The results in Table 5.12 are the frequency, percentage, mean (M) and standard deviation (S.D) statistics showing the item measure, component/dimension measure

and overall composite measure of the responses with regard to the availability of PSICT in teaching and learning of ICT in basic schools in Ghana. The results indicate that a significant majority, 518 (86.3%) of the respondents, disagreed or strongly disagreed computer laboratory was available in the schools, while the minority 82 (13.7%) agreed there was. The mean response or statistics ($M=1.62$) shows that the respondents disagreed computer laboratory was available in the schools. On adequacy of computers in the school, a very significant majority, 559 (93.2%) of the respondents, disagreed or strongly disagreed there were adequate computers but a few, 41 (6.8%) of the respondents, agreed or strongly agreed to that. The mean response indicates that the respondents strongly disagreed there were adequate computers in the schools ($M = 1.40$). The greater majority, 509 (84.8%) of the respondents, disagreed or strongly disagreed schools had computers installed with enough software/programmes or applications but the minority 91 (15.2%) agreed or strongly agreed. The mean statistics, however, shows that the respondents disagreed schools had computers installed with enough application software or programmes ($M = 1.71$). The cumulative response indicates that the majority (88.1%) of the respondents disagreed or strongly disagreed ICT infrastructure component of PSICT was available. The cumulative mean response or statistics of 1.62 means that the respondents disagreed ICT infrastructure as component PSICT was available in the basic schools. What this result suggests is that ICT infrastructure is not available in the basic schools to support teaching and learning of the ICT programme.

Furthermore, on PSICT in teaching and learning of ICT, a significant majority 563 (93.8) of the respondents disagreed or strongly disagreed they received support to participate in ICT seminars against the few 37 (6.2%) who agreed they received support to attend ICT seminars. The mean statistics also indicates that the respondents strongly

disagreed they received support to attend ICT seminars ($M = 1.23$). The greater majority 577 (96.2%) of the respondents disagreed or strongly disagreed they received support to attend ICT conferences while the minority 14 (2.3%) agreed they received support to attend ICT conferences. The mean statistics of 1.18 shows that the respondents strongly disagreed they received support to participate in ICT conferences. A significant majority 577 (96.2%) of the respondents also disagreed or strongly disagreed they received support to attend ICT workshops, while the minority 14 (2.3%) agreed they received support to attend ICT workshops. The mean statistics of 1.11 indicates that the respondents strongly disagreed they received support to participate in ICT workshops. Looking at the cumulative response, almost all (95.4%) of the respondents disagreed or strongly disagreed there was support for provision of ICT training component of PSICT. This is corroborated by the cumulative mean statistics ($M = 1.19$), which shows that the majority of the respondents strongly disagreed there was support for ICT training as a component PSICT in the basic schools. It is safe to say from the results that there is no support for teachers and students in the basic schools to attend ICT training programmes to acquire, upgrade or update their ICT knowledge and skills in the teaching and learning of the ICT programme.

Still on availability of pedagogical support for ICT, the results show that the greater majority 567 (94.5%), 514 (85.7%) and 466 (77.6%) of teachers and students agreed or strongly agreed there were available classrooms for ICT lessons, there were adequate classrooms for ICT lessons, and indicated there were available tables and chairs for use by teachers and students during ICT lessons respectively. Each of the mean statistics also indicates that the teachers and students agreed there were available classrooms, adequate classrooms, and available table and chairs for ICT lessons respectively ($M=4.20; 3.97; 3.84$). The cumulative response indicates that a significant

majority (86%) of the teachers and students agreed or strongly agreed there was support for the provision of the latent variable 'facility' or the facility component of Pedagogical Support for (PSICT). The cumulative mean response also points to the fact that the teachers and students agreed there was support for the provision of facility component of PSICT in teaching and learning of ICT ($M = 3.94$). What this result imply is that there is available support for the provision of basic facilities as component PSICT with regard to classrooms, tables and chairs for teaching and learning of ICT at the basic school.

Again, the results show that the significant majority 511 (82.2%), 538 (89.7%), and 546 (91%) of the respondents agreed or strongly agreed there was support for the provision of notebooks for ICT notes, exercise books for ICT exercises, and writing materials for writing respectively but a few of them 62 (10.3%), 34 (5.7%) and 54 (9%) disagreed or strongly disagreed. The mean statistics also indicate that the teachers and students agreed there was support for the provision of notebooks, exercise books, and writing materials respectively ($M = 4.11; 4.37; 3.91$). The cumulative response indicates that a significant majority (88.6%) of the teachers and students agreed or strongly agreed there was support for the provision of teaching and learning resource as component PSICT. The cumulative mean response or statistics of 4.14 indicates that the teachers and students agreed there was support for the provision of resources for teaching and learning as component PSICT. This result suggests that basic schools are supported with the provision of basic teaching and learning resources such as notebooks, exercise books and writing materials to support teaching and learning of ICT.

Again, the results show that a very significant majority 557 (92.9%) of the respondents disagreed or strongly disagreed there was in place award/prize for best ICT

teachers in the schools. The mean response also indicates that the respondents strongly disagreed there was in place any award/prize for best ICT teachers in the schools ($M = 1.28$). All the respondents 600 (100%) disagreed or strongly disagreed government pays special allowance to teachers who teach ICT in the school. Similarly, the mean response also indicates that the respondents strongly disagreed government pays special allowance to teachers who teach ICT in the school ($M = 1.14$). The majority 480 (80%) of the respondents once again disagreed or strongly disagreed that ICT teachers in the school were provided with laptop to motivate them teach the ICT subject. This is corroborated by the mean response which indicates that the respondents disagreed ICT teachers in the school were provided with laptop to motivate them to teach ($M = 1.67$).

The cumulative responses of the three items show that the majority (90.9%) of the respondents disagreed or strongly disagreed that incentive as component PSICT was available for teaching and learning of ICT. This is again supported by the cumulative mean statistics which indicates that the respondents strongly disagreed there was support for provision of incentive as component PSICT (1.39). What this result implies is that there is no special incentive package for the teaching and learning of ICT in the basic school.

The cumulative aggregate of the responses of the component or dimensional PSICT variables/measures show that the majority (58.93%) disagreed or strongly disagreed over the availability of PSICT in teaching and learning of ICT, while the minority (38.65%) agreed or strongly agreed. The cumulative aggregate mean statistics further indicates that teachers and students disagreed there was available PSICT in teaching and learning of ICT in the basic schools ($M = 2.48$). In summary, the results of the study show that there is lack of adequate PSICT in basic schools for the teaching and learning of ICT in Ghana.

The quantitative phase of the study was followed by the qualitative phase to elaborate and explain the need for pedagogical support, and pedagogical support available for the teaching and learning of ICT in basic schools in Ghana. This was done through interview with teachers and students, focus group discussion with teachers and students, and observation in the schools by the researcher. Some direct quotations of the participants are presented using pseudonyms.

5.12.1 Need and Availability of Pedagogical Support for ICT

in Basic Schools

From the interview conducted with the students, all the five interviewees opined that ‘the teaching and learning of ICT in schools require massive PSICT, especially the practical aspect of the subject’. They further indicated ICT tools, such as computers, are not available. For instance, one participant detailed that:

...Yes, ICT requires some form of support, but we do not have computers...and also, computer labs...(Ronaldo)

The results from the interview with teachers show that all the interviewees indicated that ICT teaching and learning required pedagogical support for ICT. The schools do not have ICT tools, particularly computers, and this was blamed on the government, except one interviewee who indicated they had computers in their school but they were inadequate. For example, one participant indicated that:

...ICT support is needed in my school...as you can see there are no ICT tools in this school...(Pepe).

Another teacher indicated that:

...Oh yeah! I can confirm ICT teaching and learning require some form of support provided...aam I have been teaching this subject for about twelve years now...but ICT subject is not like English that is supposed to be theory...It is

supposed to be practical...but unfortunately, we don't have ICT lab, and the lack of computers and tools makes us also teach the subject theoretically...(Mario)

Teachers and students were interviewed with regard to the pedagogical support needed for ICT teaching and learning in the school. Teachers and students confirmed that the pedagogical support for ICT needed for teaching and learning in the school included the 'provision of ICT infrastructure, ICT training, Incentive, School Facility and resource for teaching and learning'. For instance, one of the teachers confirmed that:

...Yes! we need these (provision of ICT infrastructure, ICT training, Incentive, School Facility and resource for teaching and learning) supports... We need training and facilities to help make teaching and learning more resourceful and interesting (Obuo). One of the students also confirmed that:

...Yes! Our school need ermm ICT lab and ICT textbooks so that we can use it in learning and in practical work... so that we can understand it more and more...And all the things you mentioned...(Messi)

The researcher conducted a focus group discussion (FGD) with teachers to find out the PSICT in teaching and learning of ICT. The results from the focus group discussion revealed that the teaching and learning of ICT at the basic school level needs PSICT, and some of the support that the participants indicated are ICT infrastructure, ICT training, Incentive, School Facility and resource for teaching and learning. For instance, one of the participants in the focus group discussion indicated that:

We need infrastructures, like buildings, to keep the IT tools.... Teachers also, need to be trained well for the ICT subject... We need much of the computers... ICT teachers need incentives (e.g., financially) ...[Pepe]

Additionally, the participants gave reasons why PSICT was lacking or appropriate PSICT was not provided for teaching and learning of ICT in the school. For example, the participants indicated that:

The incentives are not coming and purchasing of data bundle is done by the teacher. The government has realised that putting up infrastructures are capital-intensive. The government is not up and doing, and she must be up and doing...(Mario)

Lastly, teachers expressed their views on the two most important PSICT areas government should first provide, tackle or concentrate on. The results from the focus group discussion showed that the two most important PSICT areas government should concentrate on are ICT infrastructure and ICT training. For instance, one of the participants noted that:

We need the computer lab and computers [ICT infrastructure] and training of the facilitators (teachers) [ICT training] ...(Obuo)

The researcher conducted a focus group discussion with students to find out the PSICT in teaching and learning of ICT. The results from the focus group discussion showed that the teaching of ICT at the basic school level needs PSICT, and some of the supports that the participants indicated are ICT infrastructure, ICT training, Incentive, School Facility and resource for teaching and learning. For instance, one of the respondents in the focus group discussion indicated that:

Yes, we need them. If we have the ICT infrastructure [computer], it helps us to learn how to search for information on the internet. Infrastructure and incentives [teachers need to be motivated] and they need training too (Kakai).

One of the respondents said that:

We need school facilities and infrastructures because when ICT is taught by the teachers, they need to demonstrate it so that we can also practise it (Joobi).

Additionally, the respondents gave reasons why PSICT was lacking or appropriate PSICT was not provided for teaching and learning of ICT in the school.

One of the respondents indicated that

Yes, ICT support is lacking. It is lacking because the government is doing many projects (Mamavi).

Lastly, students expressed their views on the two most important PSICT areas government should first provide, tackle or concentrate on. The results from the focus group discussion showed that the two most important PSICT areas government should concentrate on are ICT infrastructure and ICT teaching and learning resources (e.g., books). For instance, the respondents indicated that

I want to say that, if the Government cannot provide any support, then the government should provide classroom for the school... At least, one computer for a particular classroom (Mamavi).

Again, another respondent indicated that:

They [Government] must provide us with school facilities such as buildings and computers... And computer laboratories (Kakai).

This result shows that one of PSICT areas that students want the government to focus on is provision of ICT infrastructure (computers).

Also, one of the respondents said that:

The government must provide us with numerous books... ICT books (Joobi).

This suggests the students want the government to provide them with more ICT books for the learning of ICT.

The researcher conducted an observation study in selected schools to find out the PSICT in teaching and learning of ICT. The researcher observed from four out of the five schools that were selected for the observation that computer laboratory was not available in the schools. In one of the schools, the school had computer laboratory. This means that majority (n = 4, 80%) of the schools that were selected for the observation did not have a computer laboratory. For instance,

In School E, I found that computer laboratory was available. However, the rest of the schools did not have a computer laboratory.

With regard to computers, I found that there were no adequate computers in the school (computer lab.). In all the schools, there was no adequate computers. Surprisingly, in the school (School E) that had a computer laboratory, there were no adequate computers. Also, in all the five schools, there was no computers installed with at least MS word, Excel and Power point.

On the other hand, in all the five schools, it was observed that classroom for ICT lessons was available and there was adequate classrooms for ICT lessons. Also, tables and chairs in the classrooms for teachers and students to use during ICT lessons were available. Notebooks for ICT notes were available, exercise book for ICT exercises and writing materials were available.

5.4.2 Teaching and Learning of ICT in Basic Schools in Ghana

Research Question 2: How effective is the teaching and learning of ICT in basic schools in Ghana?

Table 5.13 Effectiveness of Teaching and Learning of ICT in the Ghanaian Basic

Schools

ITEMS/SUBSCALES	VLE	MLE	LSRE	NC	LE	ME	VME	MEAN	S.D
Teacher is able to prepare lesson plan for ICT.	0 (0%)	0 (0%)	0 (0%)	8 (1.3)	38 (6.3%)	104 (17.3%)	450 (75.0%)	6.53	.688
Teacher is able to prepare ICT teaching notes.	0 (0%)	0 (0%)	0 (0%)	28 (4.7)	38 (6.3%)	157 (26.2%)	377 (62.8%)	6.47	.811
Teacher is able to deliver /present ICT lessons.	0 (0%)	0 (0%)	0 (0%)	8 (1.3)	67 (11.2%)	259 (43.2%)	266 (44.3%)	6.30	.718
<i>Teaching of ICT</i>	<i>0 (0%)</i>	<i>0 (0%)</i>	<i>0 (0%)</i>	<i>44 (2.4)</i>	<i>143 (7.9%)</i>	<i>520 (29%)</i>	<i>1,093 (60.7%)</i>	<i>6.43</i>	<i>.739</i>
Students are able to follow ICT lessons in class.	0 (0%)	66 (11%)	0 (0%)	33 (5.5)	47 (7.0%)	226 (37.7%)	228 (38.0%)	5.75	1.53
Students are prepared for theoretical ICT lessons.	0 (0%)	66 (11%)	0 (0%)	0 (0%)	139 (23.2%)	178 (29.7%)	217 (36.2%)	5.69	1.50
Students are prepared to participate in assessment tasks in ICT	1 (.2%)	0 (0%)	0 (0%)	0 (0%)	128 (21.3%)	263 (43.8%)	208 (34.7%)	6.04	1.05
<i>Learning of ICT</i>	<i>1 (.2%)</i>	<i>132 (7.3)</i>	<i>0 (0%)</i>	<i>33 (1.8)</i>	<i>314 (17.4%)</i>	<i>667 (37.1%)</i>	<i>653 (36.2%)</i>	<i>5.82</i>	<i>1.37</i>
TEACHING & LEARNING OF ICT	1 (.02)	132 (3.7)	0 (0%)	77 (2.1)	457 (12.7)	1,187 (32.98)	1,746 (48.5)	6.13	1.05

Commented [WU10]:

Commented [WU11]:

Response Scale: Very Lesser Extent [VLE] =1; Much Lesser Extent [MLE] =2; Lesser Extent [LSRE] =3; Not Certain [NC] =4; Less Extent [LE] =5; Much Extent [ME] =6; Very Much Extent [VME] =7 **N = 600**

Source: Data from questionnaire survey, 2021

Table 5.13 shows respondents' evaluation of the effectiveness of ICT teaching and learning in the Ghanaian basic schools. The results show that a very significant

majority 554 (92.3%) of the respondents held the view that, to a much extent or a very much extent, teachers were able to prepare their ICT lesson plan for teaching. The mean response also indicates that, to a very much extent, teachers were able to prepare their ICT lesson plan (M=6.53). The greater majority – 534 (89%) - of the respondents were of the view that, to a much extent or a very much extent, teachers were able to prepare their ICT teaching notes for teaching. The mean response of 6.47 also indicates that, to a much extent, teachers were able to prepare their ICT teaching notes. The majority – 525 (87.5%) - of the respondents again held the view that, to a much or very much extent, teachers were able to deliver or present ICT lessons appropriately to students in the classroom. The mean statistics or response also shows that, to a much extent, teachers are able to deliver their ICT lessons to students appropriately (M=6.30). The cumulative response of the item measures indicates that a greater majority (89.7%) of the respondents were of the view that, to a much or very much extent, the teaching of ICT in the basic schools was effective. The cumulative mean response or statistics also indicated that, to a much extent, ICT teaching was effective in the basic schools (6.43). To a much extent, ICT teaching was effective in the basic schools.

The results further show that the majority – 454 (75.7%) - of the respondents indicated that, to a much or very much extent, students were able to follow ICT lessons in class and the mean response (M = 5.75) also indicates that, to a much extent students were able to follow ICT lessons in class. Majority 395 (65.9%) of the respondents held the opinion that, to a much or very much extent, students were always ready or prepared for ICT lessons. The mean response also indicates that, to a much extent, students showed readiness for ICT lessons (M = 5.69). Majority 471 (78.5%) confirmed that, to a much or very much extent, students were prepared or showed willingness/readiness

to participate in ICT assessment tasks, while the mean statistics also indicated that, to a much extent, students were prepared to partake in ICT assessment tasks (M = 6.04).

Cumulatively, the majority (73.3%) of the respondents agreed, to a much or very much extent, ICT learning was effective in the basic school. The cumulative mean of 5.82 also indicated that, to a much extent, ICT learning is effective. The aggregate responses of the item measures of the teaching construct and the item measures of the learning construct indicate that majority (2,933, 81.5%) of the respondents were of the view that, to a much or very much extent, ICT teaching and learning was effective in the basic schools. This is corroborated by the mean response, which also indicated that, to a much extent, the teaching and learning of ICT was effective in the basic schools (M=6.13). In summary, the results of the study showed that there was effective teaching and learning of the ICT programme in the basic school.

5.13.1 Opinions on the Effectiveness of the Teaching and Learning of ICT in Basic Schools

The researcher interviewed teachers and students about the effectiveness of ICT teaching and learning to elaborate and explain the quantitative results. The interview results from students revealed that ICT teaching and learning in the school was effective. However, the interviewees responded that the teaching and learning of ICT in the school was mainly theoretical, and the theoretical aspect was more effective than the practicals. For instance, one of the students indicated that

ICT teaching and learning is effective and more interesting than other subjects.

But the theory is more effective than the practicals...(Ronaldo)

However, one of the students responded that:

ICT is not effective because we do not get the practical aspect. Yes, the theory is more effective than the practicals. (Aguero)

Teachers were interviewed to ascertain the effectiveness of ICT teaching and learning in schools. The results of the interview showed that the theoretical aspect of ICT teaching was more effective than the practicals. One of the teachers responded that

I can confirm it is effective in a way...Yes, the theory is more effective than the practicals. Because, we do not have the facilities to support the practicals. (Obuo)

Also, one of the teachers indicated that:

Yes, to some extent, it is effective. It is not all that effective because of inadequate ICT tools in the school...It is mainly theory, because there are not enough machines, computers and other tools to help in the practical aspect. (Emerald)

Moreover, another teacher indicated that:

For my school, it is effective. However, it is not 100%... It is the theoretical aspect that is effective but the practicals need more attention. (Mani)

The results from the interview implies that, to some extent, the teaching and learning of ICT was effective. However, the theoretical aspect of the subject (ICT) was more effective, as compared to the practical aspect.

The participants were also interviewed to confirm whether teachers' ability to prepare ICT lesson plan, ICT teaching notes, deliver ICT lesson and students' ability to follow ICT lessons, preparedness to attend ICT class and readiness to participate in ICT assessment tasks can be used as basis/measures to assess effectiveness of teaching and learning of the ICT programme in the basic school. The results show that the mentioned

factors can be used as a basis to assess the effectiveness of ICT teaching and learning, particularly, the theory aspect. One of the students responded that:

Yes, it can be the effectiveness of the ICT...Because we did do our class test...And we prepare very much to learn ICT (Aguero).

Another student indicated that:

Yes Sir...Sir, first of all, you have to look at the teacher who is teaching us...How, how fluent the teacher is...And the resources that are being used to teach...So if we lack those infrastructures, it may not be effective...But if we have them, it means that it is effective. ...But, for students, you have to ask them questions... If they can answer them, then it is effective...If they cannot answer them, then it is not effective...But even if they can answer them but don't understand, it is not effective (Messi).

Moreover, one teacher indicated that:

Well, teachers' ability to prepare ICT lesson notes, lesson plan and students' readiness to attend ICT class... I think can be used to assess the childrens' effectiveness...But here is the case that the students are only prepared in the theory side...lacking the practical aspect...In this context, err I can, I can confidently say the students can pass well in the theory side but the practicals, I am not sure...Exactly, for the theory aspect. Well, to do a practical assessment, I think ah there should be the tools in front of the the child and it is being tasked to do certain aspect of it...perform a task with the machine (Emerald).

In the focus group discussion, students were asked why ICT teaching and learning was effective, despite the general lack of PSICT in the school. It was found

that the ICT lesson notes that the teachers gave and also how teachers sometimes improvised by bringing their own Laptop to the classroom to teach the ICT made the teaching and learning effective. One of the respondents said that:

Yes, this is because the [ICT lesson] notes that they [teachers] give to us, when we apply it, it works. Because even though the school does not have it [computer]... the teachers normally use their laptop to teach us (Joobi).

An observation was conducted to find out the effectiveness of ICT teaching and learning in the five selected schools. In all the schools, it was observed that teachers were able to prepare ICT lesson plan and delivery ICT lessons. For instance, in School A, the researcher observed that teachers had prepared their lesson plan and also were able to teach the content of ICT to the students. This suggests that teachers were effective in ICT lesson plan preparation and delivery.

Also, it was observed that students were able to follow ICT lessons in class, and they showed willingness towards attending ICT class. Buttressing this, it was observed that students participated in ICT assessment tasks.

However, it was observed that ICT teaching and learning focussed on only the theoretical aspect of the subject. Again, ICT teaching and learning did not focus on both theory and practicals. This result stems from the unavailability of computers in the schools for ICT practicals.

5.4.3 Teachers' and Students' ICT Self-Efficacy

Research Question 3: What perception do basic school teachers' and students' have about their ICT Self-Efficacy in Ghana?

Table 5.14 Basic School Teachers and Students Perception about their ICT Self-Efficacy

ITEMS	Strongly Disagree	Disagree	Not Certain	Agree	Strongly Agree	Mean	S.D
I am able to use Word processor (MS Word) to create, edit and format documents for specific purposes.	6 (1%)	28 (4.7%)	28 (4.7%)	267 (44.5%)	271 (45.2%)	4.28	.83
I am able to use the internet to search for information and resources.	67 (11.2%)	44 (7.3%)	28 (4.7%)	177 (29.5%)	284 (47.3%)	3.94	1.35
I am able to use email for communication.	73 12.2%	66 (11.0%)	27 (4.5%)	150 (25.0%)	284 (47.3%)	3.84	1.43
I am able to use presentation software (Power Point) for delivery, eg. lesson or other presentation tasks.	226 (37.7%)	52 (8.7%)	141 (23.5%)	81 (13.5%)	100 (16.5%)	2.62	1.50
ICT SELF-EFFICACY	372 (15.6%)	190 (7.9%)	224 (9.3%)	675 (28.1%)	939 (39.1%)	3.67	1.28

Scale: Strongly Disagree =1, Disagree =2, Not Certain =3, Agree = 4, Strongly Agree = 5
N =600

Source: Data from questionnaire survey, 2021

Table 5.14 shows teachers and students perception about their ICT self-efficacy. The greater majority, 538 (89.7%) of the respondents agreed or strongly agreed they could use Word processor (MS Word) to create, edit and format document while the mean response also showed that the respondents agreed they could (M = 4.28). The

majority 461 (76.8%) of the respondents agreed or strongly agreed they could use the internet to search for information and resources and the mean response also indicated that the respondents agreed ($M = 3.94$). The majority, 434 (72.3%) of the respondents agreed or strongly agreed that they could use e-mail for communication and the mean response also indicated that the respondents agreed they could use e-mail for communication (3.84). The majority, 278 (46.4%) of the respondents disagreed or strongly disagreed about their self-efficacy to use presentation software - Power Point - but the minority, 181 (30%), agreed or strongly agreed about their self-efficacy to use presentation software – Power Point. The mean statistics or response (2.62), however, indicates that the respondents were not certain about their ICT self-efficacy with respect to presentation software – Power Point. The responses of the item measures revealed that majority (67.2%) of the respondents agreed or strongly agreed that they believed in their self-efficacy to use ICT to perform basic tasks – what Teo and Koh (2010) called Basic Computer Skill (BCS), in this case Basic ICT Skills (BICTS). The mean response of 3.67 also indicates that the respondents agreed about their self-efficacy to perform Basic ICT Skills. The results therefore, showed that teachers and students in the basic school believed in their ICT self-efficacy with regard to using ICT to perform basic ICT tasks.

From the results, only the Teo and Koh (2010) Basic Computer Skills (BCS), by extension Basic ICT Skills (BICTS), was worth assessing at the basic school and only their four BCS measures were relevant to assess teachers' and students' ICT self-efficacy at the basic school.

5.14.1 Teachers' and Students' Perception of their ICT Self-Efficacy

Once again, to elaborate and explain the quantitative results, a qualitative study was undertaken about teachers' and students' ICT self-efficacy. From the interview conducted, students confirmed that they could use ICTs to perform basic ICT tasks such as to create, edit and format document, use the internet to search for information and to send and access email.

From the interview, one of the students asserted that:

...Yes Sir, I can create document and format it...When it comes to using the internet to search for information too, I am very good... I can also use it to send and access email. (Pablo)

Also, one of the students went on to say that:

...I believe I can use ICT to perform all of these basic ICT tasks... I can create and edit documents... I can use it to access my email and send message. (Sakora)

Again, the results from the interview showed that two of the students interviewed indicated that they could prepare and use the Power Point in learning. For example, one of the interviewees indicated that:

Yes, I know Power Point. I can prepare and use Power Point in learning. (Messi)

However, three of them responded that they cannot prepare and use Power Point in learning. For instance, one of the students responded that:

No, I don't know what Power Point is... I can't use it since I have not been taught. (Aguero)

In addition, one of the students indicated that:

Yes, I know Power Point presentation... I have been taught in class...But I can't use it. (Ronaldo)

Teachers were interviewed to ascertain their ICT self-efficacy beliefs. The interview results showed that teachers were highly efficacious in ICT use. One of the teachers indicated that:

I can use ICT to perform basic ICT tasks such as create, edit and format document; use the internet to search for information and to send and access email. These are basic ICT skills that every ICT teacher is supposed to know and practise them. (Mario)

Also, all of the teachers interviewed indicated that they could prepare and use Power Point in teaching. One of the teachers responded that:

Yes, I am certain about my efficacy to prepare and use Power Point in teaching. Every ICT teacher should be able to use Power Point for presentations. (Obuo)

In addition, one of the teachers indicated that:

I can prepare and use Power Point in teaching. Yes, sometimes, I use slides and Power Points to deliver my lesson. (Emerald)

The observation from the schools showed that teachers were able to use Word processor (MS Word) to create, edit and format document, the internet to search for information and email for communication (send and access email). The result implies that teachers are efficacious in using ICTs to perform basic ICT tasks.

Also, students were observed to find out their self-efficacy of ICTs use. It was discovered that students were able to use Word processor (MS Word) to create, edit and format document, the internet to search for information and email for communication (send and access email). This suggests that students are efficacious in using ICT to perform basic ICT Skills irrespective of the inadequate computers in the schools.

5.4.4 Test of Research Hypotheses using Structural Equation Modelling results from AMOS

After confirming that the measurement models satisfy the conditions of construct and factor reliability in addition to the convergent and discriminant validity, the research hypotheses were assessed. The first four (4) research hypotheses were assessed using Structural Equation Modelling (SEM) results from AMOS. The assessment concentrated on the direction and strength by means of the path coefficient and significance level (p-values). The structural models in Figure 5.1, Figure 5.2, Figure 5.3 and Figure 5.4 respectively present the results for the following hypotheses:

H₁: Pedagogical Support for ICT (PSICT) significantly influences Teaching and Learning of ICT (TLICT).

H₂: Pedagogical Support for ICT (PSICT) significantly influences Teachers' and Students' ICT Self-Efficacy (TSICTSE).

H₃: Teachers' and Students' ICT Self-Efficacy (TSICTSE) significantly influences Teaching and Learning of ICT (TLICT).

H₄: Teachers' and Students' ICT Self-Efficacy (TSICTSE) mediates between Pedagogical Support for ICT (PSICT) and Teaching and Learning of ICT (TLICT).

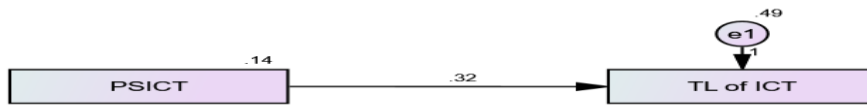


Figure 5.1: AMOS path model showing the influence of pedagogical support for ICT on teaching and learning of ICT

Source: Fieldwork (2021)

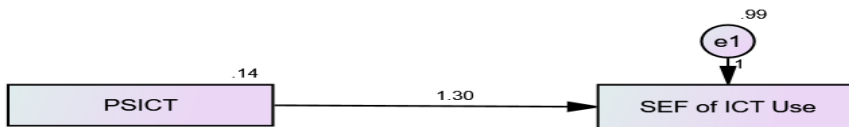


Figure 5.2: AMOS path model showing the influence of pedagogical support for ICT on teachers' and students' ICT self-efficacy

Source: Fieldwork (2021)

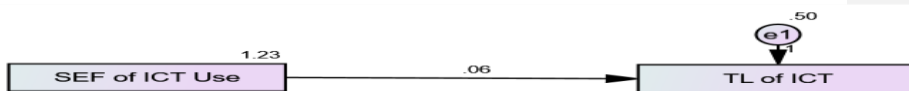


Figure 5.3: AMOS path model showing the influence of teachers' and students' ICT self-efficacy on teaching and learning of ICT

Source: Fieldwork (2021)

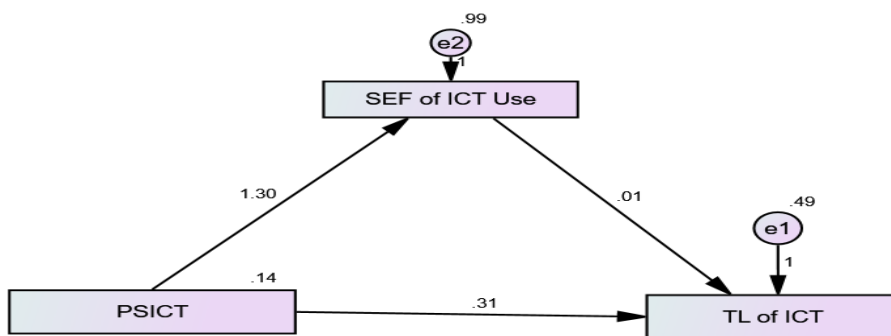


Figure 5.4: AMOS structural model showing the mediation role of teachers' and students' ICT self-efficacy (TSICTSE) in the influence of pedagogical support for ICT (PSICT) on teaching and learning of ICT (TLICT)

Source: Fieldwork (2021)

5.4.4.1 Estimates of the Path Models through Structural Equation Modelling

Table 5.15: Results of the Path Models through Structural Equation Modelling

Path	<i>B</i>	SE	CR	<i>p-value</i>	Decision
TLICT <--PSICT	.322	.077	4.184	<.001***	H ₁ : Supported
TSICTSE<-PSICT	1.300	.110	11.854	<.001***	H ₂ : Supported
TLICT< TSICTSE	.056	.026	2.162	.031	H ₃ : Supported

Source: Fieldwork (2021)

Results in Table 5.15 show that pedagogical support for ICT has a statistically significant positive influence on teaching and learning of ICT ($B = .322, p < .001$). Research hypotheses 1, which states that pedagogical support for ICT (PSICT) significantly influences teaching and learning of ICT (TLICT), was sustained.

In a follow-up qualitative study, the participants were asked in an interview whether lack of pedagogical support for ICT negatively affects teaching and learning of ICT in the basic school. It was revealed that lack of PSICT negatively affects teaching and learning of ICT. One of the teachers, for instance, indicated that:

Yes, the teaching and learning of ICT requires ICT tools to make teaching and learning more meaningful. They (students) need the practical aspect of the theory, since ICT entails a lot of practicals. So, that will encourage the students to learn ICT (Pepe).

Again, in a focus group discussion, teachers provided their views on the effect of lack of PSICT on teaching and learning of ICT in the school. The participants indicated that lack of PSICT negatively affected teaching and learning of ICT in the school. This is summarised in a quote by one of the participants:

Yes, it affects them [students] so much. So, you [the teacher] only go and teach in abstract. Because of lack of practicals, it becomes very difficult for them [students] to understand some of the things in the theoretical aspect (SkyLee).

Results in Table 5.15 again show that pedagogical support for ICT has a statistically significant positive influence on self-efficacy of ICT use ($B = 1.300, p < .001$). Research hypotheses 2, which states that pedagogical support for ICT (PSICT) significantly influences teachers' and students' ICT self-efficacy (TSICTSE), was also sustained.

In a focus group discussion, teachers provided their views on whether lack of PSICT negatively affects their ICT self-efficacy in the school. It was discovered from the focus group discussion that lack of PSICT affects teachers' ability to teach some of the contents in the ICT syllabus. One of the teachers detailed that:

Yes, I don't (do not) have the facility [ICT tools such as computers, laptops, projectors and the likes]; it will be very difficult to teach some of the things or topics to students (Romeo).

Furthermore, students provided their views on whether lack of PSICT negatively affect their ICT self-efficacy in the school. It was discovered from the focus group discussion that lack of PSICT affects students' ability to practise some of the ICT topics that have been taught. One of the students detailed that:

Yes, because we lack these [ICT] equipment, computers with Mavis Beacon installed on it, we are not able to practise how to type to enhance our typing ability (Mamavi).

The result from Table 5.15 again shows that teachers and students ICT self-efficacy has a statistically significant positive influence on teaching and learning of ICT ($B = .056, p = .031 < .05$). Research hypothesis 3 which states that teachers' and

students' ICT self-efficacy (TSICTSE) significantly influences teaching and learning of ICT (TLICT) was also supported.

Table 5.16: Mediation Results of the Structural Model

Path	<i>B</i>	<i>B</i>	SE	CR	<i>p-value</i>	Decision
Constant	5.3348		.1923	27.7347	<.001***	
TLICT <--- PSICT	.307	.161	.085	3.591	<.001***	
TSICTSE <--- PSICT	1.300	.436	.110	11.854	<.001***	
TLICT <--- TSICTSE	.012	.018	.029	.402	.688	H ₄ : Not Supported

Note: *B* = unstandardised path coefficient; *β* = standardised path coefficient; *R*² = .0287
Source: Fieldwork (2021)

From Table 5.16, it can be seen that teachers' and students' ICT self-efficacy (TSICTSE) does not mediate between pedagogical support for ICT and teaching and learning of ICT [TLICT] (*B* = .012, *p* = .688 > .05). Therefore, the hypothesis, that TSICTSE mediates between PSICT and TLICT, is rejected.

Table 5.17 Descriptive Statistics for Dimensions of PSICT

Dimensions of ICT Support	Basic school category	Mean	SD
ICT Infrastructure	Primary	1.48	1.15
	JHS	1.69	.95
	Total	1.62	1.02
ICT Training	Primary	1.15	.34
	JHS	1.21	.60
	Total	1.19	.53
Facility	Primary	3.84	1.49
	JHS	3.99	.54
	Total	3.94	.96
Resource	Primary	4.22	1.05
	JHS	4.10	.85
	Total	4.14	.92
Incentive	Primary	1.27	.41
	JHS	1.45	.68
	Total	1.39	.61

Source: Fieldwork (2021)

In Table 5.17 it seems that junior high schools have higher ICT infrastructure support ($M = 1.69$, $SD = .95$), ICT training support ($M = 1.21$, $SD = .60$), facility support ($M = 3.99$, $SD = .54$) and incentive support ($M = 1.45$, $SD = .68$) as compared to primary schools. However, primary schools had higher resource support ($M = 4.22$, $SD = 1.05$) than junior high schools ($M = 4.10$, $SD = .85$). Multivariate analysis of variance (MANOVA) was conducted to ascertain the statistically significant difference in pedagogical support for ICT components based on school category.

Table 5.18 MANOVA Results of Differences in Infrastructure, ICT training, Facility, Resources, and Incentive based on School Category

Effect	Value	F	Hypothesis			Sig.	η_p^2
			df	Error df			
School	Pillai's Trace	.035	4.009	5.000	556.000	.001	.035
Category	Wilks' Lambda	.965	4.009	5.000	556.000	.001	.035
	Hotelling's Trace	.036	4.009	5.000	556.000	.001	.035
	Roy's Largest	.036	4.009	5.000	556.000	.001	.035
	Root						

Note: Box's $M = 948.381$, $F(15, 531942.886) = 62.504$, $p < .001$; $\eta_p^2 =$ Partial Eta Squared

Source: Fieldwork (2021)

The test of homogeneity of variance-covariance matrices based on Box's M test was conducted. The results of the Box's M test are $M = 948.381$, $F(15, 531942.886) = 62.504$, $p < .001$. This result means that the assumption of variance-covariance matrices has not been met. Tabachnick and Fidell (2013) opined that if the sig. value is less than .001, you have violated the assumption. Hence, Pillai's Trace test was used to test for statistical significance. In Table 5.18, it is obvious that there exists statistically significant difference in pedagogical support for ICT dimensions/components based on school category, $F(5, 556) = 4.009$, $p = .001$; Pillai's Trace = .035, $\eta_p^2 = .035$. This result means that there is a significant difference in infrastructure, training, facility, resource and incentive supports based on school category. Research hypothesis 5,

which states that there is significant difference between the pedagogical support for ICT received by primary and junior high schools, was sustained.

Table 5.19: Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	η_p^2
Corrected Model	INFR	5.302	1	5.302	5.151	.024	.009
	TRA	.352	1	.352	1.230	.268	.002
	FAC	2.493	1	2.493	2.724	.099	.005
	RES	1.694	1	1.694	2.000	.158	.004
	INC	3.973	1	3.973	10.728	.001	.019
Intercept	INFR	1232.444	1	1232.444	1197.285	.000	.681
	TRA	685.118	1	685.118	2397.339	.000	.811
	FAC	7521.965	1	7521.965	8219.281	.000	.936
	RES	8480.678	1	8480.678	10013.624	.000	.947
	INC	906.293	1	906.293	2447.211	.000	.814
School Category	INFR	5.302	1	5.302	5.151	.024	.009
	TRA	.352	1	.352	1.230	.268	.002
	FAC	2.493	1	2.493	2.724	.099	.005
	RES	1.694	1	1.694	2.000	.158	.004
	INC	3.973	1	3.973	10.728	.001	.019
Error	INFR	576.444	560	1.029			
	TRA	160.038	560	.286			
	FAC	512.490	560	.915			
	RES	474.272	560	.847			
	INC	207.389	560	.370			
Total	INFR	2059.556	562				
	TRA	957.556	562				
	FAC	9239.667	562				
	RES	10089.000	562				
	INC	1298.556	562				
Corrected Total	INFR	581.747	561				
	TRA	160.390	561				
	FAC	514.983	561				
	RES	475.965	561				
	INC	211.362	561				

*Bonferroni adjustment $p < .01$

Note: INFR = Infrastructure; TRA = Training; FAC = Facility; RES = Resource and INC = Incentive

Source: Fieldwork (2021)

The corrected models for infrastructure, $F(1, 560) = 5.151, p = .024$; training, $F(1, 560) = 1.230, p = .268$; facility, $F(1, 560) = 2.724, p = .099$; and resource, $F(1,$

560) = 2.000, $p = .158$ were not statistically significant. However, the corrected model for incentive, $F(1, 560) = 10.728$, $p = .001$, was statistically significant. Therefore, junior high schools had a higher pedagogical support for incentive as compared to primary schools.

5.10 Discussion of Results

This section of the thesis report explains and interprets the results of the study in relation to the research questions and research hypotheses, previous studies, related literature, views expressed by the respondents as well as the views of the researcher.

5.10.1 Availability of Pedagogical Support for ICT in Teaching and Learning of ICT in Basic Schools

As part of the objectives, the study sought to find out availability of PSICT in teaching and learning of ICT in the basic school. The study found that there was lack of ICT infrastructure component of PSICT in basic schools in Ghana for the teaching and learning of the ICT programme, a confirmation of Chun, Chin-Chung and Di, (2015) and Prensky's (2001) assertion of the problem of access to ICT infrastructure in schools. Though these authors failed to advance reasons as to why access to basic ICT infrastructure in schools is a problem, several reasons may account for the problem of access or lack of ICT infrastructure, particularly in the basic school, in the context of Ghana. The government may be ignorant of the basic ICT infrastructure support needs that are most relevant for ICT teaching and learning, particularly in the basic school. Also, the cost of providing this basic ICT infrastructure in all basic schools may be too high for government alone to bear considering the numbers. The issue of cost is consistent with the perspective of the teachers and students who see the provision of ICT infrastructure to be too capital intensive. It can also be argued that it is also because

it has not been one of the priorities of government. The finding that the ICT programme in the basic school lacks pedagogical ICT infrastructural support is again consistent with the findings of Peprah (2016). Peprah found that there were issues of logistics, infrastructural deficit and access, which had created a gap between theory and practice that needed to be addressed in ICT education in the basic school in the Atwima Nwabiagya Municipality in the Ashanti Region of Ghana. Correspondingly, there is unavailability of computers and other modern technologies, especially in rural schools accompanied by poor internet connectivity, and unreliable power supply (Amenyedzi, Lartey, & Dzomeku, 2011). The problem of ICT infrastructure seems to be a major issue of serious concern in ICT education. This is so because a study by Kiptalam et al. (2010) also observed that access to ICT facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in the developed countries. Even though a study by Dadzie-Bonney and Harford (2017) found that the Oguua School for the Deaf has ICT laboratory, which suggests that perhaps there is support for the provision of ICT infrastructure in the case of the school for the deaf, the same study also revealed that the laboratory did not have standard ICT tools and applications, which confirms BECTA's (2001) allusion in the literature.

A teacher participant, during the face-to-face interview, pointed out this same issue that her school had ICT laboratory but the laboratory was not stocked with adequate computers for a student population of over 500, and other schools around did not have computer laboratory at all. This means that pedagogical support for ICT infrastructure is a general problem at the pre-tertiary level in Ghana. If developing countries can really make any meaningful impact in ICT education, it will require governments and education stakeholders to pragmatically work at improving the ICT

infrastructural situation in their schools, especially at the basic level, which usually does not receive much attention.

On the issue of availability of pedagogical support for ICT training, the study found that pedagogical support for ICT training is lacking for teachers and students in the basic school. Pedagogical support for ICT training in the form of ICT conferences, seminars and workshops to help teachers upgrade or update their ICT pedagogical and content knowledge acquired from the college of education or the university is lacking. Again, support is lacking for students to complement and extend their ICT knowledge acquired in the classroom. It is important to clarify that it is not the case that these training programmes are not available. These ICT training programmes may be available, but teachers and students are not supported to participate in them. You (2010) observes that teachers who assume responsibility for imparting ICT skills to their students should themselves be able to interiorise their ICT skills and demonstrate high level of ICT knowledge because their competences in using new technologies constitute an essential prerequisite for the effective teaching of ICT skills in the school. The researcher supports this view and adds that this can be achieved through continuous ICT training for ICT implementers in the classroom.

The lack of support for practising ICT teachers and students in the school to participate in organised ICT training programmes means that the teachers, apart from the pre-service ICT knowledge acquired in the university or college, find it difficult to add to their ICT knowledge repository, and students as well will find it difficult to extend their ICT knowledge and skills gained from the classroom. As a result, teachers as well as students appear not to be knowledgeable in the use of ICT because there appears not to be any official ICT training for both teachers and students in the school (Ajayi, Ekundayo, & Haastrup, 2009). A teacher participant, during the face-to-face

interview, indicated that most of teachers teaching ICT in the basic school are not trained ICT teachers and, because they are not also supported to participate in on-the-job (in-service) ICT training programmes, teach the ICT subject anyhow. In the view of the researcher, the only reason why teachers and students are not receiving ICT training support may perhaps be due to financial cost. But the real cost of not supporting teachers and students to participate in ICT training programmes to upgrade, update or extend their ICT knowledge and skills may be far higher.

Still on pedagogical support availability, the study found that pedagogical support for school facility and school resource for ICT teaching and learning are two pedagogical supports for ICT available in teaching and learning of ICT in the basic school. The results specifically indicated facilities such as classrooms, tables and chairs are adequately available as well as resources for ICT teaching and learning, such as note books for note writing/preparation, exercise books for students' exercise and writing materials. The reason why school facility and resource for ICT teaching and learning, unlike other pedagogical supports, are available may not be far-fetched. In the view of the researcher, these two support dimensions are also required for the teaching and learning of all other subjects in the school. Their provision is meant to support general teaching and learning in the school, including the ICT subject. Therefore, it cannot be the case that they were provided purposely because of the introduction of the ICT programme. Thus, these facilities and resources are provided or would be provided for teaching and learning in the school whether or not the ICT programme was introduced. Nevertheless, their availability is essential for the ICT programme.

The finding, particularly that pedagogical support for basic teaching and learning resources are available for teaching and learning of ICT in the basic school, however, is in dissonance with the proposition of Yara and Oteno's (2010). They

claimed that the education systems in many developing countries are faced with a number of shortcomings including inadequate teaching and learning resources in basic and secondary schools due to poor planning and corruption. Yara and Oteno perhaps expressed a general view about problem of education systems in developing countries, while this study empirically looked at the availability of resources for teaching and learning of ICT in basic schools in Ghana. Also, while Yara and Oteno were looking at the entire problems in both basic and secondary schools, this study focussed on basic schools. Probably, they were also looking beyond basic facility and resources for teaching and learning in the basic and secondary school. The researcher is of the view that the present results failed to support their assertion because of the contextual differences. Nevertheless, their observation vindicates the participants' request for ICT textbooks to enhance the learning of the subject. This is an indication that schools lack adequate textbook, which is a major teaching and learning resource for ICT.

Unlike pedagogical support for facility and resource for teaching and learning ICT, incentive/motivation, the last dimension of PSICT was also found to be lacking for teachers and students in basic schools. Incentives are something which is given in addition to wages. It means additional remuneration or benefit to an employee or a person in recognition of achievement or to induce him to work better. A combination of financial and non-financial incentives helps in bringing motivation and zeal to work in ways that really enhance the productivity of teachers in the school system (Mumanyire, 2005). Thus, while incentive is essential to boost teachers' morale to work in extra-ordinary ways, key incentive support, such as laptops, special allowance and award for best teachers of ICT, which the teachers expect, are lacking in the basic school. Some participants, during the qualitative study, expressed a strong view that, since teachers do improvise to teach ICT particularly because of lack of ICT

infrastructure, teachers should be given financial incentives to help maintain the tools, targets or laptops and data/bundle they used in improvising to teach the students. The lack of incentive or motivation suggests that teachers teach the ICT programme in the basic school because they are obligated to teach and not because of any special inducement they get. Students also are intrinsically forced to learn to pass the ICT subject and not because of any external motivation they receive.

Recognising these PSICT components/needs and an effort to ensure their availability in the basic school can be essential for the effective implementation of the ICT programme in the basic school, not only in Ghana but all serious education systems across the globe.

5. 10.2 Effectiveness of Teaching and Learning of ICT in Basic Schools

With regard to the issue of the effectiveness of the teaching and learning of the ICT programme, the study found that, to a large extent, the teaching and learning of the ICT programme is effective. Activities related to ICT teaching and learning, such as preparation of lesson plan, teaching notes, lesson delivery, following of lessons in class, preparedness for ICT lessons and assessment of lessons, are effectively carried out in the schools to a large extent. The effectiveness or effective performance of these activities in the school indicate that the teaching and learning of ICT, to a large extent is effective.

The effectiveness of the ICT programme, however, is in relation to the theory aspect and not the practical aspect. Participants were of the view that these indicators could only be used as a basis to assess the theory aspect and not the practical aspect. They explained that, to assess the effectiveness of the teaching and learning of ICT practical, one must look at the availability of ICT tools in the school such as computers,

projectors, internet, among others (ICT infrastructure), how ICT tools or resources are used in the ICT teaching and learning process, the competency with which the teachers use the tools and the ability of students to use ICT tools to perform various tasks. They concluded that practical ICT was less emphasised and not effective due to lack of pedagogical support for ICT in the basic school, particularly ICT infrastructure (eg. computer).

This finding that teaching and learning of the practical aspect of ICT was ineffective and less emphasised confirms Ghavifekr and Rosdy (2015) position that the holistic implementation and effectiveness of an ICT curriculum programme (ICT teaching and learning) hinges on the sufficiency of ICT infrastructure. Access to computer laboratory and equipment will ensure that subject teachers are able to present the curriculum to learners as officially planned or intended (Hennessy, Ruthven, & Brindley, 2005).

The observation study by the researcher found that ICT tools for teaching and learning of the subject were lacking, and the teaching and learning of ICT practical was lacking or not emphasised. This observation corroborates the participants' view that ICT is basically a practical subject but the lack of appropriate pedagogical support for ICT, especially computers (ICT infrastructure), has made its teaching and learning theoretical in the basic school. It is not surprising, therefore, that teaching and learning of ICT practical was not effective in the basic schools. The schools need ICT infrastructure support to avert the situation.

The reason why the teaching and learning of the theory aspect of ICT was found to be effective, despite the lack of pedagogical support for ICT, may not be far-fetched. According to the student participants, the ICT theory is effective because of the notes teachers give and the fact that teachers sometimes improvise. This suggests that

teachers in the basic schools are sacrificing a lot, amidst the challenges that they are confronted with, to ensure the implementation of the ICT programme is successful. The researcher also opines that teachers' and students' quest to avoid being blamed by stakeholders for poor results in the ICT subject at school level and the Basic Education Certificate Examination (BECE) is also a reason why they may want to do anything possible to ensure the effectiveness of the programme, if for nothing at all, at least, the theory aspect amidst the challenges.

Also, the teaching and learning of ICT theory is presumed to require less pedagogical support for ICT compared to the practical aspect. This view of the researcher was confirmed by the participants during the face-to-face interview and focus group discussions. Hence, a reason why ICT theoretical teaching and learning was found to be effective in the face of an apparent lack of support for the programme. The practical aspect, which requires much pedagogical support for ICT is not emphasised in the basic school due to lack of appropriate support for ICT, particularly ICT infrastructure, most especially, computers.

For students to fully benefit from the ICT curriculum and for the curriculum to achieve its goal in the national education curriculum, it is important that both the theory and practical contents are emphasised in the basic school. It is only through this that students can develop the necessary skills and competencies in using ICT and as well appreciate the usefulness of ICT in their life. In line with the position of Ghavifekr and Rosdy (2015), the researcher is of the view that pedagogical support for ICT infrastructure to basic schools is inevitable for the holistic and effective teaching of ICT, which emphasises both theory and the practical aspects.

5.10.3 Teachers' and Students' ICT Self-Efficacy in the Basic School

The results of the study revealed that teachers and students in the basic school perceived themselves to have the self-efficacy to perform basic ICT skills including to create, edit and format document, use the internet to search for information and to send and access email. The availability and increase in the use of Mobile phone as part of modern way of life/living may be a major factor that has contributed to teachers' and students' ability to use ICT to perform these basic tasks. Even without computers available in the schools, teachers and students have easy access to mobile phones to use at home and in the school, particularly teachers. In the case of students, it is usually at home. Since the mobile phones usually have some of these ICT functions or applications, their frequent use by teachers and students enables them to develop these basic ICT skills – typing/creating, editing and formatting documents, using the internet to search for information and sending and accessing email. It, therefore, comes at no surprise that though computers are lacking in the basic schools, teachers and students believe in their self-efficacy to use ICT to perform these basic functions.

The researcher holds the opinion that, since teachers improvise by using their phones in the absence of computers to teach ICT in the school, and access to and use of mobile phones helps teachers and students to acquire or develop basic ICT skills, the lack of support for the supply of computers to schools should prompt Ghana Education Service to reconsider the ban on mobile phone use by students in the school policy. Students should be allowed to use mobile phones in the school but it must be regulated. This is so because, in the absence of computers in the school to help students develop basic ICT skills, the only substitute or alternative to help students develop basic necessary ICT skills is access to and use of the mobile phone.

The use of presentation software (Power Point) is also a basic computer skill in which teachers have high self-efficacy (Teo & Koh, 2010). The quantitative results of this study however, found that teachers and students in the basic school were not certain about their self-efficacy to use the Power Point application in teaching and learning. While majority of the students confirmed this in a follow-up interview, few of the students and all the teachers indicated that they could use Power Point in teaching and learning. Teachers appear to be more efficacious in the use of Power Point as compared to the students from the interview conducted. This situation may be attributed to the fact that most teachers have computers/laptops with this application at home but computers with this application are not available in the schools for the students to experience. The lack of computers in the school perhaps explains why majority of the students were not certain they have the ability to use the Power Point presentation in teaching and learning. As indicated by one student, *'No, I don't know what Power Point is... I can't use it, since I have not been taught'* (Aguero). Another student responded that: *'Yes, I know Power Point presentation... I have been taught in class...But I can't use it'* (Ronaldo). These views of the students justify the researcher's assertion that the unavailability of computers with Power Point application makes some students uncertain about their ability to prepare and use the Power Point presentation software.

A study by Teo and Koh (2010) to determine the computer self-efficacy of teacher trainees in Singapore revealed that teachers' computer self-efficacy was influenced by three multidimensional factors: Basic Computer Skills (BCS), Media-Related Skills (MRS), and Web-Based Skills (WBS). This means that these three multidimensional factors jointly determine the overall computer self-efficacy of teachers. The findings of this study do not support their finding. This study found that in determining the ICT self-efficacy of teachers and students in the basic school, only

the Basic ICT Skills (Basic Computer Skills) influence their ICT self-efficacy. The items related to Media-Related Skills (MRS) and Web-Based Skills (WBS) of Teo and Koh's (2010) Computer Self-Efficacy Scale do not apply or are not useful to assess teachers' and students' ICT self-efficacy in the basic school.

The present study indicated that only the four items related to Teo and Koh's (2010) Basic Computer Skills (use of word processor, use of internet to search for information, use of email for communication and use of presentation software) are applicable to measure or assess the overall ICT self-efficacy of teachers and students in the basic school. What might have accounted in the difference in the results is that Teo and Koh's (2010) study focussed on teacher trainees' curriculum in Singapore, which aimed at equipping the teacher trainee with both basic and high-level computer skills, while the present study focussed on the Ghanaian basic school ICT curriculum, which aims at equipping the students with only basic ICT skills.

Despite these differences in the two studies, one of the findings of the present study supports a finding of Teo and Koh (2010). Their study found high computer self-efficacy for Basic Computer Skills ($M=6.26$) among the Singapore teacher trainees. This result was confirmed by this study which also found that teachers and students in basic schools in Ghana also perceived themselves to have the self-efficacy to demonstrate or perform Basic ICT skills ($M= 3.7$) when their self-efficacy of ICT use was assessed on a five-point likert scale in relation to creating, editing and formatting document, using the internet to search for information, sending and accessing email, and use of Power Point application. The present study is also supported by the findings of Akbaba (2013) who found that teachers' perception of the use of instructional technology in teaching is positively related to their self-efficacy.

The finding also does not support Sarfo, Amankwah and Konin's (2017) finding that generally, senior high school teachers are not certain about their Computer Self-Efficacy; but specifically confirms their finding that senior high school teachers are self-efficacious in basic computer skills.

The researcher holds the view that teachers' and students' perception of their ICT self-efficacy should affect their actual use of ICT to complete task. Thus, high level of ICT use among teachers and students is an indication that they have high belief in their ICT self-efficacy.

5.10.4 Influence of Pedagogical Support for ICT on Teaching and Learning of ICT in the Basic Schools

The study found that pedagogical support for ICT (PSICT) positively and significantly influences teaching and learning of ICT in the basic schools. What this means is that the provision or lack of individual components of pedagogical support for ICT or composite pedagogical support for ICT contributes to making teaching and learning of ICT effective or ineffective in the basic school. This finding is supported by the literature that individuals (teachers and students) with effective ICT training possess better opportunities to acquire more new knowledge and skills as well as competence to be more able to perform ICT tasks effectively and with a better quality (Amin et al., 2013).

Again, the finding confirms the findings of Pephrah (2016) that issues of logistics, infrastructural deficit and access has created a gap between theory and practice that need to be addressed in ICT education in Ghanaian basic schools. Correspondingly, this study had revealed that lack of ICT infrastructure support affects the teaching and learning of ICT practicals in schools. Students also underscored the

need for government to support schools (students and teachers) with ICT textbooks. This shows how ICT textbooks and other teaching and learning resources are relevant to the teaching and learning of ICT and how their provision or their lack can have significant influence on the effective teaching and learning of the ICT programme. Similar to the influence of teaching and learning resources on effective teaching and learning of ICT, a combination of financial and non-financial incentives helps in bringing motivation and zeal to teachers and students (individuals) in ways that really enhance or influence their productivity or performance in the school system (Mumanyire, 2005).

Also, the provision of the full armour of pedagogical support for ICT or lack of it contributes to making ICT teaching and learning effective or ineffective. It is not surprising, therefore, that the study found the teaching and learning of ICT practicals as a problem in Ghanaian basic schools. Most basic schools in Ghana are faced with the problem of inadequate supply of ICT infrastructure (computers), trained ICT teachers and ICT textbooks. The lack of these supports, particularly computers, has made the teaching and learning of ICT basically theoretical and the practical ineffective. The lack of adequate pedagogical support for ICT is negatively affecting the holistic implementation of the ICT curriculum in the basic school. Students are not experiencing the totality of the ICT curriculum as envisaged. They have been denied the opportunity to experience the practical skills and knowledge that is essential to prepare them to join the information society (Linford, 2007). With this state of affairs, Ghana may be far from reaching the goals and purpose of the ICT curriculum in the basic school anytime soon if pragmatic steps are not taken or interventions not made.

The influence and the need for the training of ICT teachers has been observed by Peprah (2016). He indicated that teachers are central to the integration of ICT in

education, for which reason they must be properly trained to acquire the technical know-how in ICT. This can be achieved through periodic workshops, seminars, and in-service training to update teachers' knowledge and skills in ICT to make them more conversant with the teaching of the subject. The influence and the need for pedagogical ICT infrastructure support has also been underscored by Moses et al (2012). They opined that ICT infrastructure can act as a facilitating condition to influence ICT teaching and learning as well as use of ICT. The teaching and learning of ICT in basic school, therefore, will require the development of ICT infrastructure in the schools.

The issue of ICT textbooks, classrooms and incentive for teachers also have a far-reaching influence on teaching and learning of ICT. They must, therefore, not be left out in any attempt to provide holistic pedagogical support for ICT in implementation of the ICT programme in the basic school.

5.10.5 Influence of Pedagogical Support for ICT on Teachers' and Students' ICT Self-Efficacy in the Basic School

The study found that pedagogical support for ICT (PSICT) positively and significantly influences teachers' and students' ICT self-efficacy in the basic school. What this means is that the provision of PSICT or lack of it contributes to teachers' and students' self-efficacy (ability or inability) of ICT use in the basic school.

With the necessary pedagogical support for ICT available, teachers and students would be able to show much more competency of ICT use than just to create, edit, and format document, use the internet to search for information and send and access email. It is not surprising majority of students do not believe in their self-efficacy to use the Power Point presentation software. It is because of lack of PSICT in the schools, particularly computers with the Power Point application. Teachers and students will be

much able to use ICT if schools have the necessary ICT infrastructure, are well trained in ICT and are motivated to use ICT.

5.10.6 Influence of Teachers' and Students' ICT Self-Efficacy on Teaching and Learning of ICT

One major finding of the study was that TSICTSE positively and significantly influences teaching and learning of ICT. This finding is consistent with the findings of Gbemue et al., (2020), Hatlevik et al., (2018), Hatlevik and Hatlevik (2018) and Rohaggi, Scherer and Hatlevik (2016). Gbemue et al., (2020) found that teacher educators' ICT self-efficacy belief affects their actual use of ICTs in their teaching/instructional practice. Hatlevik et al., (2018) also found that students' ICT self-efficacy is positively related to their performance in ICT (ICT learning) in school. Hatlevik and Hatlevik (2018) also found that teachers' self-efficacy for using ICT in their teaching practice is associated with their use of ICT in teaching and their general ICT self-efficacy. Rohaggi, Scherer and Hatlevik (2016) also found that students' self-efficacy in basic ICT skills is positively related to their computer information literacy achievement. They also found that students ICT use and ICT self-efficacy are positively correlated with their school-related learning task (ICT learning). A conclusion can, thus, be drawn that teachers' and students' ICT self-efficacy affects or influences their teaching and learning of ICT in schools.

5.10.7 The Mediation Role of Teachers' and Students' ICT Self-Efficacy in the Influence of Pedagogical Support for ICT and Teaching and Learning of ICT

The study found that Teachers' and Students' ICT Self-Efficacy does not mediate between pedagogical support for ICT and teaching and learning of ICT. This finding, thus, suggests that TSICTSE is not an alternative way (route) to Pedagogical

Support for ICT in an attempt to achieve effective teaching and learning of the ICT programme in the basic school, though it also positively and significantly influences the teaching and learning of the ICT programme.

5.10.8 Availability of Pedagogical Support for ICT in Primary and Junior High Schools

The study found that there exists statistically significant difference in pedagogical support for ICT dimensions based on school category. Junior high schools have higher ICT infrastructure support, ICT training support, facility support and incentive support, as compared to primary schools. However, primary schools had higher pedagogical resource for teaching and learning than junior high schools. The provision of pedagogical support for ICT in teaching and learning of the ICT programme is, thus, better or more favourable among junior high schools than primary schools. The researcher is of the view that what account for this difference is as a result of the number of schools in the primary and junior high school category. Government resources for providing pedagogical support for ICT in schools are relatively scarce. The junior high school category is presumed to receive better pedagogical support for ICT because the number of schools in that cohort are fewer, compared to the primary school category. Thus, the number of schools affected the pedagogical support for ICT received at each level of education.

5.10.8 Relating the Results of the Study to the Theoretical Framework (Social Support Theory)

The results of the study validates the efficacy of the application of the social support theory to improve and better a condition or situation also in the context of education – teaching and learning of ICT in schools. The results of the study revealed

that the teaching and learning of ICT is influenced by the provision of pedagogical support for ICT. This means that application of the social support theory, particularly instrumental support, which emphasises the provision of tangible support, can be useful to positively influence the teaching and learning of ICT in schools. Meaning, reliance on the social support theory to provide key instrumental pedagogical support for ICT, such as computers, projectors, ICT textbooks, financial incentives, training, classrooms, table and chairs etc., in ICT education can reduce the problems and concerns schools (teachers and students) have regarding teaching and learning of ICT, and significantly enhance and improve the effectiveness of the teaching and learning of the ICT programme or subject in schools in order to achieve its purpose in the educational curriculum of basic schools in Ghana.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to summarise the findings of this study and to make some further significant conclusions. It also reflects on the outcome of this study, and highlights various implications relating to the key findings emerging from this research for improving the provision of pedagogical support for ICT curriculum implementation in basic schools in Ghana. Finally, the chapter makes recommendations towards providing and improving pedagogical support for ICT in teaching and learning of ICT at the basic school, and also recommends potential areas for further research.

6.1 Summary of the Study

This study aimed at investigating the influence of pedagogical support for ICT (PSICT) in teaching and learning of ICT (TLICT) in basic schools in Ghana and the mediating role of teachers' and students' ICT self-efficacy (TSICTSE). To achieve the goal of the study the following research questions and research hypotheses were formulated:

- To what extent is appropriate pedagogical support for ICT (PSICT) available in the teaching and learning of ICT in basic schools in Ghana?
- How effective is the teaching and learning of ICT in basic schools in Ghana?
- What perception do basic school ICT teachers and students have about their ICT self-efficacy?
- **H₁**. Pedagogical support for ICT (PSICT) significantly influences the teaching and learning of ICT (TLICT) in basic schools in Ghana.

- **H₂**. Pedagogical support for ICT (PSICT) significantly influences teachers' and students' ICT self-efficacy (TSICTSE) in basic schools in Ghana.
- **H₃**. Teachers' and students' ICT self-efficacy (TSICTSE) significantly influences the teaching and learning of ICT (TLICT) in basic schools in Ghana.
- **H₄**. Teachers' and students' ICT self-efficacy (TSICTSE) mediates the relationship between pedagogical support for ICT (PSICT) and teaching and learning of ICT (TLICT) in basic schools in Ghana.
- **H₅**. There is significant difference between the pedagogical support for ICT (PSICT) in primary and junior high schools in Ghana for teaching and learning of ICT (TLICT).

The study was carried out by drawing sample from ten districts in ten regions using multi-staged sampling. The sequential explanatory mixed method research design was employed. The sample size for the quantitative study and qualitative study was 600 teachers and students, and 20 teachers and students respectively. The quantitative data was collected using a survey questionnaire. Interviews, focus group discussion and observation were used to collect the qualitative data. Descriptive statistics, regression and MANOVA analysis were employed to analyse the quantitative data using both SPSS 23.0 version and AMOS statistical software for data analysis. The qualitative data was analysed thematically.

6.1.1 Key Findings of the Study

The main findings of the study in line with the research questions/objectives and the research hypotheses are summarised and presented as follows.

6.1.1.1 Availability of Pedagogical Support for ICT in Teaching and Learning of ICT in the Basic School

The study found that, generally, there is lack of pedagogical support for ICT in teaching and learning of the ICT programme in basic schools in Ghana [Mean = 2.45] (refer to Table 5.14 & participants' view).

The study found that the teaching and learning of ICT at the basic school need or require pedagogical support for ICT in the form of ICT infrastructure, ICT training, School facility, Resource for teaching and learning, and Incentive (refer to Table 5.11, 5.12, 5.14, Fig. 5.1 & participants' view).

The study also revealed that ICT infrastructure (computer) is the most basic pedagogical support for ICT basic schools need for effective teaching and learning (implementation) of the ICT programme [participants' view].

The study found that lack of ICT infrastructure, particularly computer, makes it difficult for teachers and students to engage in ICT practical lessons in the basic schools (participants' view).

The study found that three most important areas of pedagogical support for ICT that need urgent and immediate attention of government are ICT infrastructure (computers), ICT training for ICT teachers, and teaching and learning resources (ICT textbooks) [participants' view].

6.1.1.2 Effectiveness of ICT Teaching and Learning in Basic Schools in Ghana

The findings of the study indicated that, though pedagogical support for ICT is generally lacking, there is effective teaching and learning of the ICT programme in the

basic school because teachers give notes to students and sometimes improvise in the teaching and learning process [Mean = 6.13] (refer to Table 5.15 & participants' view).

The study also revealed that teaching and learning of ICT practicals is not effective in basic schools in Ghana (participants' view).

6.1.1.3 Teachers' and Students' Perception of Their ICT Self-Efficacy

The study found that teachers and students in the basic school believe in their self-efficacy to use ICT to perform basic ICT tasks - use MS Word to create, edit and format a document; use the internet to search for information and to send and access e-mail [Mean = 3.7] (refer to Table 5.16).

6.1.1.4 Influence of PSICT on Teaching and Learning of ICT

The findings of the study showed that pedagogical support for ICT (PSICT) positively and significantly influenced the teaching and learning of ICT at the basic school ($B = .322, p < .001$).

6.1.1.5 Influence of PSICT on Teachers' and Students' ICT Self-Efficacy

The findings of the study showed that pedagogical support for ICT (PSICT) positively and significantly influenced teachers' and students' ICT self-efficacy at the basic school ($B = 1.300, p < .001$).

6.1.1.6 Influence of Teachers' and Students' ICT Self-Efficacy on Teaching and Learning of ICT

The findings of the study revealed that teachers' and students' ICT self-efficacy has positive and significant influence on teaching and learning of ICT in basic schools in Ghana ($B = .056, p = .031 < .05$).

6.1.1.7 Mediation Role of Teachers' and Students' ICT Self-Efficacy in the Influence of Pedagogical Support for ICT on Teaching and Learning of ICT

The results of the study indicated that teachers' and students' ICT self-efficacy does not mediate between pedagogical support for ICT and teaching and learning of ICT ($B = .012, p = .688 > .05$).

6.1.1.8 Difference in Pedagogical Support for ICT in Primary and Junior High School

The study found that there is a significant difference in pedagogical support for ICT provided in terms of ICT infrastructure, ICT training, physical facility for ICT teaching and learning, teaching and learning resources for ICT and incentive to motivate teaching and learning of ICT, based on school category ($F [5, 556] = 4.009, p = .001$; Pillai's Trace = .035, $\eta_p^2 = .035$).

6.2 Conclusions

The findings of the study suggest or lead to the following conclusions.

1. Pedagogical support for ICT in implementation (teaching and learning) of the ICT programme or curriculum in the basic school has been very low or non-existent/non-available since the introduction of the programme in Ghana.
2. The Ministry of Education has not shown much commitment to providing appropriate pedagogical support for ICT in teaching and learning of the ICT programme at the basic school due to ignorance of its essence, lack of funds or the fact that it does not consider it a priority area.
3. The issue of pedagogical support for ICT required for effective implementation of the ICT curriculum programme was not considered at the development, planning and design stage.

4. The fact that the teaching and learning of ICT practical is not emphasised, ineffective and unexamined at the basic school suggests that the ultimate goal of the ICT curriculum is not being fully achieved as planned or envisaged.
5. The ICT programme at the basic school can be much better implemented, much more effective, and teachers and students can demonstrate much more competency in ICT use than just competency in basic ICT skills, with the right kinds of pedagogical support for ICT provided to basic schools.
6. The provision of pedagogical support for ICT is necessary for holistic and effective teaching and learning of ICT as well as enhancing teachers' and students' ICT self-efficacy at the basic school.
7. There is positive and significant influence of Pedagogical support for ICT on teaching and learning of ICT at the basic school.
8. There is positive and significant influence of Pedagogical support for ICT on teachers' and students' ICT self-efficacy at the basic school.
9. There is positive and significant influence of Teachers' and students' ICT self-efficacy on teaching and learning of ICT in basic schools.
10. There is no mediation of teachers' and students' ICT self-efficacy in the influence of pedagogical support for ICT and teaching and learning of ICT.
11. There is difference in pedagogical support provided between primary and junior high schools in Ghana. Thus, junior high schools receive favourable PSICT than primary schools.
12. The fact that PSICT and teachers' and students' ICT self-efficacy positively and significantly influenced teaching and learning of ICT suggest that teaching and learning of ICT will be effective and improved if adequate PSICT is

provided in schools and also when teachers and students are ICT self-efficacious and vice-versa.

6.3 Theoretical, Research and Practical Implications of the Study

Apart from the conclusions drawn from the findings; the findings of the study also have several far-reaching implications, as indicated below.

6.3.1 Theoretical Implications

The fact that PSICT influences teaching and learning of ICT but is lacking in teaching and learning of ICT in basic schools in Ghana is a significant finding. The finding provides empirical evidence that appropriate PSICT availability contributes to effective or ineffective teaching and learning of ICT in school, as postulated by the conceptual framework that underpins the study. The teaching and learning of ICT in basic schools in Ghana as well as in other contexts can actually improve/be effective with provision of appropriate PSICT. The result presents an additional validation and also adds new insights to the effectiveness of the PSICT-model; it, therefore, increases the generalisability power of the PSICT model and, by extension, the 'social support theory'. In simple terms, the result implies that the PSICT model is robust for different referent systems.

In addition, the results of the study provides empirical validation of the theoretical knowledge base of the construct 'PSICT'. The results contributes to the understanding of PSICT with regard to teaching and learning of ICT. More specifically, in this study, ICT infrastructure, ICT training, facility, resources for teaching and learning, and incentive have been validated as components of PSICT on which effective teaching and learning or ineffective teaching and learning of ICT hinges. PSICT can,

therefore, have different effects on teaching and learning of ICT based of how it is managed.

Also, ICT self-efficacy contributes to effective or ineffective teaching and learning of ICT in school which is in line with the literature. This makes it imperative to ensure teachers and students become ICT self-efficacious in any meaningful implementation of ICT curriculum programme in the school. Correspondingly, PSICT also contributes to ICT self-efficacy theoretically. Therefore, improving PSICT provision in the school makes teachers and students more ICT self-efficacious.

Contrary to expectations, the finding that teachers' and students' ICT self-efficacy does not mediate between PSICT and teaching and learning of ICT relationship is surprising and new and, therefore, significant. Thus, while ICT self-efficacy influences teaching and learning of ICT, it does not mediate or serve as an alternative route or means to PSICT in achieving effective teaching and learning of ICT or a substitute to PSICT in the quest to promoting effective teaching and learning of ICT in schools.

Also, the findings that there is significant difference in PSICT between primary and junior high schools suggest that the number of schools at any level of education affects the PSICT that government is able to provide for teaching and learning of ICT. The greater the number of schools at a level of education, the lower the availability of PSICT provided for teaching and learning of ICT and vice-versa.

6.3.2 Research Implications

As the literature review brought to light, empirical research in the area of pedagogical support for ICT in teaching and learning of ICT seems generally limited and research studies in the area are hard to come by. Obviously, this research should

act as a springboard for further research agenda in the area of ICT teaching and learning in school.

One issue which emerged from the study was that pedagogical support for ICT accounts for 29 percent ($R^2 = .0287$) of ICT teaching and learning in the basic school. This means/implies that other factors influence teaching and learning of ICT beyond the provision of pedagogical support for ICT, which needs to be researched.

Also, on the basis of the model framework for assessment of pedagogical support for ICT in teaching and learning of ICT, a replication of the study in a different context using the framework or model will be useful to confirm the generalisability power of PSICT model for assessing teaching and learning of ICT in schools.

6.3.3 Practical Implications

The contributions reveal new insights in the effectiveness and practicality of PSICT in influencing (improving) teaching and learning of ICT as well as teachers' and students' ICT self-efficacy in schools. These insights will serve as a basis to provide guidelines and appropriate policies on PSICT to promote effective teaching and learning of ICT in schools.

The study does acknowledge the effectiveness and practicality of the PSICT model/framework as an effective and comprehensive model to assess availability of PSICT in teaching and learning of ICT in schools. It also acknowledges the fact that the provision of appropriate PSICT ensures effective teaching and learning of ICT in school to realise the goal of ICT curriculum.

6.4 Recommendations

1. The Ministry of Education and other stakeholders of education should help build computer laboratory at the basic schools and provide the schools with computers

and related ICT tools and services such as projectors and internet (data bundle), to facilitate the teaching and learning of ICT.

2. The Ministry of Education should also support (sponsor) practising ICT teachers to periodically participate in ICT training programmes to acquire and update their knowledge and skills and keep abreast of new developments and changes in the field to enhance their competency or capacity.
3. The Ministry of Education (MoE) should again provide all basic school pupils/students and ICT teachers with an ICT textbook to facilitate and enhance the teaching and learning of the subject.
4. The Ministry of Education (MoE) should periodically assess the pedagogical support for ICT available for teaching and learning of ICT as well as the effectiveness of the programme for major interventions to improve the programme's implementation in the basic school.
5. The Ministry of Education should make the issue of providing appropriate pedagogical support for new curriculum implementation a major priority.
6. The Ministry of Education and the National Council for Curriculum and Assessment (NaCCA) should always do, carryout/undertake need assessment of the pedagogical support that will be required for any new curriculum programme implementation at the curriculum development, planning and the designing stage and not be an after-thought of implementation deficiencies.
7. The Ministry of Education should always provide the needed pedagogical support (material and non-material resource support) to schools before embarking on full-scale implementation of new curriculum programme or an innovation in the educational system.

8. The Ministry of Education should encourage all ICT teachers to improvise, particularly using their laptop, to teach the students in the short-term until the Ministry is able to provide all schools with the required computer infrastructure. This will ensure that, in the short-term, the teaching and learning of ICT practicals also goes on in the schools.
9. Considering the challenges ICT teachers go through in the basic school to ensure that the ICT programme is effectively taught, apparently without the necessary pedagogical support for ICT provided to the extent that some teachers sometimes sacrifice to improvise their own resources to teach the students, the Ministry should give them special allowance to serve as incentive.

6.5 Contributions of the Study

This study makes a significant contribution to knowledge, particularly in the area of curriculum implementation, by producing empirical evidence of the level of pedagogical support for ICT available for the teaching and learning of the ICT programme, the effectiveness of the programme as well as teachers' and students' ICT self-efficacy in basic schools in Ghana.

Still on knowledge, the study has produced empirical evidence on the influence of the provision of pedagogical support for ICT on teaching and learning of ICT, as well as on teachers' and students' ICT self-efficacy at the basic school.

The study also makes significant contribution to methodology in ICT education research. The practice of combining quantitative and qualitative methodologies in a single study, particularly the sequential explanatory mixed method design, seems relatively not common in the academic research culture of Ghana and school-based research. Therefore, this thesis, which adopted the sequential explanatory mixed

method design by using survey questionnaire, interview, focus group discussion and observation study to collect data, is a major contribution to methodology.

The study also makes a significant contribution to literature. As the literature revealed, pedagogical support for teaching and learning of the ICT curriculum programme appears to be an area that has not been widely researched locally and internationally. It appears there is scanty literature and much is not known about the subject worldwide, particularly Ghana. This study, therefore, helps to add to the limited literature on the issue of pedagogical support for programme implementation in general and in particular, pedagogical support for ICT teaching and learning in school, especially the particular context of basic schools in Ghana.

Theoretically, the study contributes to understanding of the relationship (influence) of pedagogical support for ICT on teaching and learning of ICT. Thus, the study validates and confirms the positive relationship or influence of PSICT on TLICT. By extension, it also contributes to understanding the effectiveness of the social support theory application to improve and better a phenomenon in several areas including education, particularly ICT education.

The study also provides a comprehensive model/framework and instruments for assessing pedagogical support for ICT in the teaching and learning of ICT in basic schools in Ghana. The model and scales can be applied in other research contexts.

1.6 Recommended Areas for Further Research

1. Exploring factors influencing teaching and learning of ICT in basic schools in Ghana beyond provision of pedagogical support for ICT.
2. Assessment of pedagogical support for ICT in teaching and learning of ICT in senior high schools in Ghana.

REFERENCES

- Ababio, B. T. (2013). Nature of Teaching: What teachers need to know and do. *International Journal for Innovation Education and Research*, 1(3), 33-39.
- Acquah, B.Y. S. (2012). Status of implementation of the ICT Curriculum in Ghanaian Basic Schools. *Journal of Arts and Humanities* 1(3), 27-37.
- Adentwi, K. I. (2017). *Basic education, school improvement and indiscipline*. Unpublished speech delivered at Supreme Saviour International School graduating ceremony, Kumasi.
- Adeogun, A. A. (2001). Instructional resources and school effectiveness in private and public secondary schools in Lagos State. *Lagos Journal of Educational Administration and Planning*, 1(1), 74 – 81.
- Adu-Gyamfi, S., Donkoh, W. J., & Addo, A. A. (2016). Educational reforms in Ghana: Past and present. *Journal of Education and Human Development*, 5(3), 158-172.
- Ajayi, I. A., & Ekundayo, Hastrup T. (2009). The application of information and communication technology in Nigerian secondary schools. *International NGO Journal*, 4(5), 281-286.
- Akbaba, A. (2013). Characteristics of Small Hospitality Business: A Study in an Urban Setting in Turkey”. *Hospitality Review*, 30(2), 39- 72.
- Akrofi, D. (2010). *Distance education at the University of Education, Winneb: Challenges and prospects*. Unpublished Master’s Thesis, University of Cape Coast.
- Akyeampong, E. (2014). Commerce, credit and mobility in the nineteenth-century Gold Coast: Changing dynamics in Euro-African trade. *Africa’s Development in Historical Perspective*. New York, 231-263.

- Akyeampong, K. (2010). Educational expansion and access in Ghana: A Review of 50 years of challenge and progress. *Consortium for Research on Educational Access, Transition and Equity*, No. 33.
- Alameen, L., Male, T., & Palaiologou, L. (2015). Exploring pedagogical leadership in early years education in Saudi Arabia. *School Leadership & Management: Formally School Organisation*, Doi: 10.1080/13632434-2014-992773.
- Albaugh, E. A. (2005). *Language policies in African education*. Brunswick: Bowdoin College.
- Aliaga-Polo, U. T. (2022). A study on pedagogical support in teacher. *Asian Journal of Education and Social Sciences*, 23(4), 44-50.
- Ally, M. (2008). Foundations of educational theory for online learning. In T. Anderson (Ed.). *The theory and practice of online learning* (pp.15-44). Athabasca, AB: Athabasca University.
- Alreck, P. L., & Settle, R. B. (1985). *The survey research handbook*. Home-Wood: Irwin
- Alzheimer's Diseases International [ADI] (2010). Statement of the Regional Committee for the Western Pacific, 061. WHO Regional Office for the Western Pacific.
- Amenyedzi, F. W., Lartey, M. N., & Dzomeku, B. M. (2011). The use of computers and internet as supplementary sources of educational material: A case study of senior high schools in the Tema metropolis in Ghana. *Contemporary Educational Technology*, 2(2), 151- 166.
- Amidon, E. J. (1967). *The role of the teacher in the classroom: A manual for understanding and improving teachers' classroom behaviour*. New York: Association for Productive Teaching.

- Amin, A., Rashid, S. M., & Lodhi, R. N. (2013). The impact of employees training on the job performance in education sector of Pakistan. *Middle -East Journal of Scientific Research*, 17(9), 1273-1278.
- Anamuah-Mensah Educational Reform Review Committee Report (2002). *White paper on the report of the educational reform review committee*, Accra: MOEYS [Ministry of Education, Youth and Sports].
- Anderson, C. (2010). Presenting and evaluating qualitative research. *American Journal of Pharmaceutical Education* 74(8). p.141.
- Anderson, H. K. (2020). Implementing the new national teacher education curriculum at the University of Education, Winneba, Ghana: Prospects, challenges, and the way forward. *European Journal of Research and Reflection in Educational Sciences*, 8(8), 1 – 14.
- Anderson, H. K., & Donkor, K. E. (2016). Problems of teaching and learning in basic schools – The case of Ewusa Demonstration Basic School, Ghana. *Advances in Social Sciences Research Journal*, 3(4), 60 – 73.
- Andoh, T. E. (2008). The Choral Music Scene in the Gold Coast (Ghana) Prior to 1933. *Ghana Bulletin of Theology* 1(3), 77-110.
- Anfom Educational Reform Committee Report (1987). *White paper on the report of the educational reform review committee*, Accra.
- Angrist, J., D., & Lavy, V. (2001). Does teacher training affect pupil learning? Evidence from Matched Comparisons in Jerusalem Public Schools. *Journal of Labor Economics*, 19(2), 343-369.
- Archer, F K. & Adentwi, K. I. (2008). *Educational management and school administration*. Kumsi: Biraa Press.

- Arkorful, V., & Abaidoo, N. (2014). The role of e-learning, the advantages and disadvantages of its adoption in higher education. *International Journal of Education and Research*, 2, 397-410.
- Armstrong, D. A. (2003). *Curriculum today*. New Jersey: Merrill Prentice Hall.
- Arthur, Y. D. (2017). *Modeling students mathematics interest in senior high school: The contextual Ghanaian perspective*. Unpublished doctoral dissertation, University of Education, Winneba, Ghana.
- Asiedu-Addo, S. K., Apawu, J., & Owusu-Ansah, N. A. (2016). The usage of ICTS in the teaching and learning of mathematics: Tracer study of mathematics educators. *Journal of Science and Research*, 2(1), 34-56.
- Ayeh, J. S. K. (2009). *Assessing the effects of the integration of ICT into the curriculum of the rural basic schools in Atwima Nwabiagya District in the Ashanti Region of Ghana*. Published master's dissertation, University of Cape Coast, Ghana. URI:<http://hdl.handle.net/123456789/1776>
- Ayodele, A. L., Anifalaje, & Bakare, O. M. (2016). Effects of some factors on electro-osmotic dewatering of laterite. *Ife Journal of Science* 18(1), 1-10.
- Babajide, V. F. T. & Bollaji, O. A. (2003). *Perception of lecturers and service teachers towards the use of communication media in teaching pure and applied science related discipline*. 44th Annual STAN conference proceedings. Pp. 33-36.
- Bagozzi, R. P. (1993). Assessing construct validity in personality research: Applications to measures of self-esteem. *Journal of Research in Personality*, 27(1), 49-87.
- Bande, S. O. (2006). Development of modern ICT and internet system. In Agagu A.A (Ed). *Information and Communication Technology and Computer Applications*. Abuja: Panof Press pp. 1-3.

- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W. H. Freeman.
- Bandura, A. (1999). A social cognitive theory of personality. In L. Pervin & O. John (Eds.). Banu, S. (2012). *Teachers' readiness for computer education classes in the secondary schools of Bangladesh*. *Bangladesh Education Journal* 10(1), 1-11.
- Bargh, J. A., Gollwitzer, P. M., & Oettingen, G. (2010). Motivation. In Fiske, S., Gilbert, D. T., & Lindzey, G. (Eds). *Handbook of social psychology*. New York: Wiley.268-316.
- Baron, G. L., & Harrari, M. (2005). ICT in french primary education, twenty years later: Infusion or transformation? *Education and Information Technologies*, 10(3), 147–156.
- Battistone, W., Buckmiller, T., & Peters, R. (2019). Assessing literacy: Are new teachers prepared to assume jobs in school districts engaging in grading and assessment reform efforts? *Studies in Educational Evaluation* 62(10), 10-17.
- BECTA (2001). Home-School Links and ICT. Becta.http:
www.becta.org.uk/page_documents/research/hsl_evidencereport.pdf
- Behlol, M. K. & Dad, H. (2010). Concept of learning. *International Journal of Psychological Studies*, 2(2), 17-29.
- Bell, G. (2008). Adaptation, extinction and global change. *Evolutionary Applications*, 1(1), 3-16.
- Bhatti, N., Maitlo, G. M., Shaikh, N., Shaikh, F. A., & Hashmi, M. A. (2012). The impact of autocratic leadership style on job satisfaction. *International Business Research*, 5(2), 197-109.

- Bogdan, R., & Biklen, S. K. (2007). *Qualitative research for education: An introduction to theories and methods* (5th ed.). Boston, MA: Pearson Education Inc.
- Bollen, K. A., & Lennox, R. (1991). Conventional wisdom on measurement: A structural equation perspective. *Psychological Bulletin*, *100*, 305-314.
- Boni, R. K. (2018). *The use of ICT for teaching and learning in senior high schools in Ghana: A study of Nungua and Presbyterian, Teshie*. Published master's dissertation, University of Ghana. <http://ugspace.ug.edu.gh>
- Borsboom, D. (2005). *Measuring the mind*. Cambridge, MA: Cambridge University Press.
- Bowen, P. W., Rose, R. & Pilkington, A. (2017). Mixed methods-theory and practice: Sequential, explanatory approach. *International Journal of Quantitative and Qualitative Research Methods*, *5*(2), 10-27.
- British Educational Research Association [BERA] (2018). *Ethical guidelines for educational research* (4th ed.). London: Prentice-Hall.
- Bryers, A. P. (2004). Psychological evaluation by means of an on-line computer. *Behaviour Research Method and Instruction*, *13*, 585-587.
- Bryman, A. (2004). *Social research methods* (2nd ed.). New York: Oxford University Press.
- Buaben-Andoh, C., & Yidana, I. (2015). Innovation in education: Students' perceptions of implementing ICT in learning in second-cycle institutions in Ghana. *Procedia-Social and Behavioral Sciences*, *197*, 1512-1519.
- Burton, L. J. & Mazerolle, S. M. (2011). Survey instrument validity part 1: Principle of survey instrument development and validity in athletic training education research. *Athletic Training Education Journal*, *6*, 27-35.

- Caesar, A. & Teye, E. (2012). *Assessment of ICT situation in Senior High Schools: A Case Study in Lower Manya Krobo District*. Retrieved 21st April, 2020 from ir.knust.edu.gh
- Campbell, C., & Smith, T., J. (1997). The relationship between occupational interests and values. *Journal of Career Assessment*.
<https://doi.org/10.1177/1069072708325740>.
- Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56, 81-105.
- Cao, L., Zhao, R., Ren, L., & Zhao J. S. (2010). Social support and anomie: A multilevel analysis of anomie in Europe and North America. *International Journal of Offender Therapy Comparative Criminology*, 54, 625-639.
- Carpenter, S. (2018). Ten steps in scale development and reporting: A guide for researchers. *Communication Methods and Measures*, 12(1), 25-44.
- Chun, L., Chin-Chung, T., & Di, W. (2015). The role of ICT infrastructure in its application to classrooms: A large-scale survey for middle and primary schools in China. *Journal of Educational Technology and Society*, 18(2), 249-261.
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, 7(3), 309-319.
- Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine*, 38, 300-314.
- Cobbold, C., & Ani-Boi, E. (2011). Primary school teachers' concerns about the implementing the 2007 educational reform in Ghana: A study in the Cape Coast Metropolis. *International Journal of Basic Education*, 1(1), 122-132.

Coldwell, M. (2017). Exploring the influence of professional development on teacher careers: A path model approach. *Teaching and Teacher Education*, 61, 189–198.

Cole, G. A. (1995). *Organisational behaviour: Theory and practice*. New York, USA:DP Publishers.

Colin, H. (1969). *Teaching geography in Ghana*. Accra: Ghana Publishing House.

Collis, J. & Hussey, R. (2014). *Business research: A practical guide for undergraduate and postgraduate students* (4th ed.). Palgrave Macmillan.

Coombs, C. H., Dawes, R., M., & Tversky, A. (1970). *Mathematical psychology: An elementary introduction*. Englewood Cliffs, NJ: Prentice Hall.

Cooper, D. R., & Schindler, P. S. (2006). *Business research methods* (8th ed.). Tata: McGraw Hill.

Cordingley, P., Bell, M., Rundell, B., & Evans, D. (2005). *The impact of collaborative continuing professional development (CPD) on classroom teaching and learning*. Retrieved on May 15, 2020, from <http://wsassets.s3.amazonaws.com/ws/nso/pdf/09598003e49523abff794962e2752c81.pdf>

Cowie, B., & Jones, A. (2005). Digital horizons: Laptop for teacher's evaluation study update on secondary teacher's experiences. Retrieved on January 7, 2020 from http://www.minedu.govt.nz/web/downloadable/dl8568_v1/laptop-leaders-report-12-9-with-edits-ds.doc. University of Waikato.

Creswell, J. W. (200). *Qualitative inquiry and research design: Choosing among five approaches*. London: Sage Publications.

- Creswell, J. W. (2015). *A concise introduction to mixed methods research*. Thousand Oaks, CA: Sage.
- Creswell, J. W. (2018). *Designing and conducting mixed methods research* (3rd ed.). Thousand Oaks: Sage Publications.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approach*. Sage, Los Angeles.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approach* (5th ed.). Sage Publications.
- Creswell, J. W., & Plano Clark, V. L. (2015). *Understanding research: A consumer's guide* (2nd ed.). USA: Pearson.
- Creswell, J. W., Plano Clark, V., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori and C. Teddlle (Eds.), *Handbook of mixed methods in social and behavioural research* (pp. 209). Thousand Oaks, Ca: Sage.
- Cronbach, L. J., & Meehl, P. E. (1995). Construct validity in psychological tests. *Psychological Bulletin*, *52*, 281-302.
- Cullen, F. T. (1994). Social support as an organizing concept for criminology. Presidential Address to the Academy of Criminal Justice Sciences. *Justice Quarterly*, *11*, 527-559.
- Czerniewicz, L., & Brown, C. (2005). Access to ICT for teaching and learning: From single artefact to inter-related resources. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, *1*(2), 42-56.

- Dadzie-Bonne, P. & Harford, S. K. (2017). Factors inhibiting students' ICT knowledge acquisition and utilisation at Oguaa School for the deaf. *Rwandan Journal of Education*, 4(1), 34-46.
- Danso, A. & Kesseh, F. N. (2016). Challenges undermining the teaching of ICT as a core subject in senior high schools in Ghana: A Study of selected schools in Kumasi Metropolis. *Journal of Information Engineering and Applications*, 4(4), 1-7.
- Darling Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives*, 8(1), 1-13.
- Davis, J. Mengersen, K. Bennett, S. & Mazerolle, L. (2014). Viewing systematic reviews and meta-analysis in social research through different lens. *Springer Plus* 3(1), 511-521.
- Davis, N., Norris, L. C., & Kratzer, F. H. (1962). Interference of soyabean proteins with the utilization of trace minerals. *Journal of Nutrition*, 77, 217-229.
- Denscombe, M. (2008). Communities of practice: A research paradigm for the mixed methods approach. *Journal of Mixed Methods Research*, 2(3), 270-283.
- Denzin, N. K., & Lincoln, Y. S. (2003). *The landscape of qualitative research theories and issues*. Thousand Oaks, CA: Sage.
- Derrick, C., & Barrie, H. (2020). Country profile of Ghana: Sport, politics and nation-building. *International Journal of Sport Policy and Politics*, 12(3), 497-512.
- Desforges, C. (1995). *An introduction to teaching: Psychological perspectives*. Wiley, John & Sons Incorporated, New Jersey.
- DeVries, R. (2000). Vygotsky, piaget, and education: A reciprocal assimilation of theories and educational practices. *New Ideas in Psychology* 18, 187-213.

- DFID Annual Report, (2007). *Government response to the committee's first report of session 2007-08*.
- Diamantopoulos, A., & Sigauw, J., A. (2006). Formative versus reflective indicators in organisational measure development: *A Journal of Management*, 17(4), 263-282.
- Dictionary.Com.
- Dijkstra, T. K & Henseler, J. (2011). "Linea indices in nonlinear structural equation models: Best fitting proper indices and other composites". *Computational Statistics and Data Analysis*, 81(1), 10-23.
- Djamila, A., & Djafri, Y. (2011). *The role of colonial education in retrospect: The Gold Coast case in the era of imperialism*. University of Abdelhamid Ibn Badis, Algeria.
- Donnelly, R. (2010). Harmonising technology with interaction in blended problem-based learning. *Computers & Education*, 54, 350–359.
- Driscoll, M. (2000). *Psychology of learning for instruction*. Needham Heights, MA: Allyn & Bacon.
- Drossel, K., Eickelmann, B. & Gerick, J. (2015). Computer use in class: The significance of educational framework conditions, attitudes and background characteristics of teachers on a level of international comparison. In A. Brodnik & C. Lewin (Eds.). *IFIP TC3 Working conference: A new culture of learning. Computing and next generations* (pp. 131–140). Retrieved from: http://www.ifip2015.mii.vu.lt/file/repository/IFIP_Proceedings_July_21.pdf

- Durak, H. Y. (2019). "Investigation of Nomophobia and Smartphone addiction predictors among adolescents in Turkey: Demographic variable and academic performance". *Social Science Journal*, 56(4), 492 – 517.
- Edumadze, J. K. E. (2015). The integration of information and communication technology for teaching and learning at Ghanaian Colleges of Education: ICT tutors' perception. *African Journal of Teacher Education*, 4(2), 28 - 40.
- Edusei, K. (2004). An overview of visual art education in Ghanaian schools. *Journal of Science and Technology (Ghana)*, 24(2), 116-120.
- Edwards, J. R., & Bagozzi, R. P. (2000). On the nature and direction of relationship between constructs and measures. *Psychological Methods*, 5, 155-174.
- Eickelmann, B. (2011). Supportive and hindering factors to a sustainable implementation of ICT in schools. *Journal for Educational Research Online*, 3(1), 75–103.
- Ertmer, P. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, 47(4), 47–61.
- Ertmer, P. A. & Newby, T. J. (2013). Behaviourism, Cognitivism, Constructivism: Comparing critical features from an instructional design perspective. *International Society for Performance Improvement*, 26 (2); 43 – 71.
- Ertmer, P., Ottenbreit, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers and Education*, 59(2), 423-435.
- Espinosa, K. J., & Caro, J. D. L. (2011). *Analysis of ICT integration initiatives in basic education and lessons learned: The Case of the Philippines*. *International Conference on Computers, Networks, Systems and Industrial Engineering*.

- Farjon, D., Smits, A. & Voogt, J. (2019). Technology integration of pre-service teachers explained by attitudes and beliefs, competency, access, and experience. *Computer Education, 1*(30), 81- 93.
- Farrant, J. S. (1980). *Principles and practice of education* London: Longman Group Ltd.
- Feilzer, M. (2010). Doing mixed methods research pragmatically: Implications for the recovery of pragmatism as a research paradigm. *Journal of Mixed Methods Research, 4*(1), 6-16.
- Finlay, D. J. (1971). *Education and policy in Ghana-African Universities and Western tradition*, by Eric Ashby. Cambridge, Mass: Harvard University Press, 1964. 113+ v pp. \$2.95.-Education and Social Change in Ghana, by Philip Foster. Chicago: University of Chicago Press, 1965. 322+ vii pp. \$7.50.-Report of Education Review Committee, Republic of Ghana, Ministry of Information. Accra-Tema: State Publishing Corp., 1967. 164+ vii pp. np. *History of Education Quarterly, 11*(3), 319-327.
- Finn, A., & Wang, L. (2014). Formative vs. reflective measures: Facets of variation. *Journal of Business Research, 67*(1), 2821-2826.
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research, 1*(8), 382-388.
- Fraenkel, J. R., Wallen, E. N. (2000). *How to design and evaluate research in education* (4th ed.). San Francisco: McGraw-Hill.
- Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Gebhardt, E. (2014). *Preparing for life in a digital age. The IEA international computer and information literacy study international report*. Amsterdam: IEA.

- Fredrickson, B. L. (2009). *Positivity: Groundbreaking research reveals how to embrace the hidden strength of positive emotions, overcome negativity, and thrive*. New York: Crown Archetype.
- Freebody, P. (2003). *Qualitative research in education: Interaction and practice*. London: Sage Publications.
- Frimpong, J. A. (1990). "Clinical supervision", *The teacher, GNAT*, Accra. Pp. 10-16.
- Fu, J. S. (2013). ICT in education: A critical literature review and its implications. *International Journal of Education and Development using Information and Communication Technology (IJEDICTO)*, 9(1), 112- 129.
- Fullan, M. (1999). *Change forces: The sequel*. London and Philadelphia: Falmer Press.
- Fullan, M. (2007). *The new meaning of educational change*. New York: Teachers College Press.
- Gage, N. L. (1963). *Handbook of research on teaching*. Rand McNally: Chicago.
- Gagne, J. M., Saint-Dizier, J. P., & Picard, M. (1974). Methods of d'échantillonnage des fonction deterministes en spectroscopie: application a un spectrometer multicanal par comptage photonique, *Appl. Opt.* 13, 581-588.
- Gay, L. R., & Airasian (2003). *Educational research competencies for analysis and applications* (7th ed.). Upper Saddle River, NJ Merrill/Prentice Hall.
- Gbemu, L. A., Sarfo, F. K., Adentwi, K. I., & Aklassu-Ganan, E. K. K. (2020). Teacher educators' self-efficacy beliefs and actual use of ICTS in teaching in the Kumasi Metropolis. *The Turkish Online Journal of Educational Technology*, 19(2), 13-22.
- Geldenhuis, J. L., & Oosthuizen, L. C. (2015). Challenges influencing teachers' involvement in continuous professional development: A South African perspective. *Teaching and Teacher Education*, 51, 203–212.

Girija, T., Meena, S., & Asokumar, M. (2020). Impact of ICT as a pedagogical tool in higher education. *International Journal of Education and Development using ICT*, 1(2), 24-48).

GES Act 778, (2008). *Education, vocational guidance and training*.
<https://www.ilo.org/dyn/natlex/natlex4.detail?>

Getange, K. N. (2016). Motivational strategies and teachers' productivity: Lessons of experiences from secondary schools in Kisii County, Kenya. *Journal of Research and Methods in Education*, 6(4), 33- 38.

Ghana statistical service [GSS] (2010). Population and housing census of Ghana.

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science (IJRES)*, 1(2), 175-191.

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science (IJRES)*, 1(2), 175-191.

Ghavifekr, S., Kunjappan, T., Ramasamy, L., & Anthony, A. (2016). Teaching and learning with ICT tools: Issues and challenges from teachers' perceptions. *Malaysian Online Journal of Educational Technology*, 4(2), 38-57.

Good, T. L., & Brophy, J. E. (1990). *Educational psychology: A realistic approach* (4th ed.). White Plains, NY Longman Publishing Company.

Gordon, R. (1965). The concept of protective identification: An evaluation. *Journal of Analytical Psychology*, 10(2), 127-149.

Gulbahar, Y. (2007). Technology planning: A roadmap to successful technology integration in schools. *Business, Computer Science; Computer Education* 49, 943-956.

- Gutierrez-Dona, B., Lippke, S., Renner, B., Kwon, S., & Schwarzer, R. (2009). Self-efficacy and planning predict dietary behaviours in Costa Rican and South Korean women: Two moderated mediation analysis. *Applied Psychology: Health and Well-Being* 1(1), 91-104.
- Habibu, T., Al-Mamum, M. A., & Clement, C. (2012). Difficulties faced by teachers in using ICT in teaching-learning at technical and higher educational institutions of Uganda. *International Journal of Engineering Research and Technology (IJERT)*, 1(7), 1-10.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ Prentice Hall: Pearson.
- Hair, J. F., Sarstedt, M., Ringle, C. M. & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Science*, 40, 414 – 433.
- Hair, J., Black, W., Babin, B., Anderson, R. & Tatham, R. (2006). *Multivariate data analysis*. (6th ed.). Upper Saddle River: Pearson Prentice Hall.
- Hardyanto, W., Purwinarko, A., & Adhi, M. A. (2018). End-user satisfaction analysis on library management system using technology acceptance model towards national standard of integrated library. *Journal of Physics Conference Series*, 983(1), 1- 6.
- Hatlevik, I. K. R., & Hatlevik, O. E. (2018). Examining the relationship between teachers' ICT self-efficacy for educational purposes, collegial collaboration, lack of facilitation and the use of ICT in teaching practice. *Frontiers in Psychology*, 9(935), 1145-1153.

- Hatlevik, O. E. (2018). Examining the relationship between teachers' self-efficacy, their digital competence, strategies to evaluate information, and use of ICT at the school. *Scand Journal of Educational Research*, 61, 555-567.
- Hatlevik, O. E., & Gudmundsdottir, G. B. (2018). Newly qualified teachers' professional digital competence: Implications for teacher education. *European Journal of Teacher Education*, 41(2), 214-231.
- Hatlevik, O. E., Throndsen, I., Loi, M., & Gudmundsdottir, G. B. (2018). Students' ICT self-efficacy and computer and information literacy: Determinants and relationships. *Computers and Education*, 118, 107-119.
- Hedeker, D., Gibbons, R. D., Waternaux, C. (1999). Sample size estimation for longitudinal designs with attrition: Comparing time-related contrasts between two groups. *Journal of Educational and Behavioural Statistics*, 6(2), 13-24.
- Hennessy, S., Ruthven, K. & Brindley, S. (2005). Teacher perspectives on integrating ICT into subject teaching: Commitment, constraints, caution, and change. *Journal of Curriculum Studies*, 37(2), 155-192.
- Henseler, J., Djikstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., Ketchen, D. J., Hair, J. F., Hult, G. T. M., & Calantone, R. J. (2014). Common beliefs and reality about partial least squares: Comments on ronkko and evermann (2013). *Organisational Research Methods*, 17(2), 182 – 209.
- Henseler, J., Ringle, C. M., and Sarstedt, M. (2015). "A new criterion for assessing discriminant validity in variance-based structural equation modelling". *Journal of the Academy of Marketing Science*, 43(1), 115 - 135.
- Henseler, J., Ringle, C., & Sinkovics, R. (2009). The use of partial least squares path modeling in international marketing. *Advance in International Marketing*, 20, 277 – 319.

- Hensler, J. (2012). "Why Generalised Structured Component Analysis Is Not Universally Preferable to Structural Equation Modeling". *Journal of the Academy of Marketing Sciences*, 8(2), 67-79.
- Herselman, M., E. (2003). *ICT in rural areas in South Africa: Various case studies*. Retrieved on 13 January, 2020 from http://proceedings.informingscience.org/152003_Proceedings/doc/120Herse.pdf.
- Hinne, K. (2012). *Doing qualitative research: A guide for researchers*. Emmpong Press, Accra- New Town.
- Hishinuma, E. S. (1990). *A theoretical and pragmatic application of paradigmatic behaviourism: Screening and identification of high potential/underachievers currently in special education*. Doctoral Dissertation, University of Hawaii. Press.
- Hishinuma, E. S. (1990). *A theoretical and pragmatic application of paradigmatic behaviourism: Screening and identification of high potential/underachievers currently in regular education*. University Microfilms International, Ann Arbor, Michigan.
- Hofman, R. H., & Dijkstra, B. J. (2010). Effective teacher professionalisation in networks? *Teaching and Teacher Education*, 26, 1031–1040.
- Homan, W. J. (2002). Stress coping strategies for commercial flight crewmembers. *Journal of Aviation/Aerospace Education and Research*, 12(1), 1-14.
- Huck, S. (2004). Two are few and four are many: number effects in experimental oligopolies. *Journal of Economic Behaviour & Organization*, 53 (4), 435 – 446.
- Huitt, W. & Dawson, C. (2011). Social development: Why it is important and how to impact it. *In Educational Psychology Interactive*. Valdosta, GA: Valdosta State

Univrsity. <http://www.edpsycinteractive.org/papers/socdev.pdf>.

- Hwang, Y. & Takana, Y. (2004). *Generalised structure component analysis. Psychometrika*, 69, 81 – 99.
- Inan, F., A., Lowther, D., L. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development*, 58(2), 137-154.
- International Standard Classification of Education (ISCED, 2001).
- Isaacs, S., Broekman, I., & Mogale, T. (2004). Contextualising education in Africa: The role of ICTs in information and communication technologies for development in Africa. *Networking institutions of Learning SchoolNet*. Edited James, T. [online] Available: <http://www.idrc.ca/openbooks/008-x>[Accessed on November 24, 2019].
- Isola, R. (2019). “Concept of teaching” *Shanlax International Journal of Education*, 7(2), 5-8.
- Jackson, P. W. (1992). *Handbook of research on curriculum*. New York: Macmillan.
- Jagero, N., Komba, H. V., & Mlingi, M. N. (2012). Relationship between on the job training and employee’s performance in courier companies in Dar es Salaam, Tanzania. *International Journal of Humanities and Social Science*, 2(22), 114-120.
- Jehan, A., Alandejani, F. M., & Basri, W. S. (2018). ICT adoption impact on students’ academic performance: Evidence from Saudi Universities. *Educational Research International*, 2018, 1-9.
- Jingtao, Z., Yuanyuan, F., & Xiaoling, M. (2010). The latest progress report on ICT application in Chinese basic education. *British Journal of Educational Technology*, 4(4), 567-573.

- Johnson, B., & Christensen, L., (2012). *Educational research* (4th ed.). Los Angeles, CA Sage.
- Johnson, D. W., Roger, T., Johnson, E., & Johnson, H. (1998). *Cooperation in the classroom*. Edina, MN.: Interaction Book Company.
- Johnson, R. B., & Onwuegbuzie, A. J., Tucker, S., & Icenogle, M. L. (2014). *Conducting mixed methods research using dialectical pluralism and social psychological strategies*. In book: *The Oxford Handbook of Qualitative Research*, Oxford.
- Kaffash, H. R., Kargiban, Z. A., Kargiban, S. A., & Ramezani, M. T. (2010). A close look into the role of ICT in education. *International Journal of Instruction*, 3(2), 63-82.
- Kamasak, R. (2011). Firm specific versus industry structure factors in explaining performance variation: Emperical evidence from Turkey. *Management Research Review*, 34, (10), 1125 –1146.
- Kante, C., Savani, V. (2003). *E-Learning: The new frontier in developing world*. TechknowLogia, January-March 2003: 15 -19 From <http://www.techknowlogia.org/TKL.Articles/PDF/458.pdf> (Retrieved on 13 March, 2020).
- Kenney, C. K. (2014). *Motivation of students on the University of Education, Winneba Post-Diploma Basic Education Distance Programme: The Case of Kumasi Campus*. Unpublished Master of Philosophy dissertation, University of Education, Winneba.
- Kerstin, D., & Birgit, E. (2017). Teachers' participation in professional development concerning the implementation of new technologies in class: a latent class analysis of teachers and the relationship with the use of computers, ICT self-

efficacy and emphasis on teaching ICT skills. *Large-scale Assessments in Education*, 5(19), 21-35.

Khan, F. M. (2009). Ethno-veterinary medicinal usage of flora of greater Cholistan desert, Pakistan. *Pak. J. Vet.*, 29(2), 75-80.

Kimberline, C. L., & Winterstein, A. G. (2008). *Validity and Reliability of measurement instruments used in research: Research fundamentals*, University of Florida, Gainesville.

Kiptalam, G. & Rodrigues, A. (2010). Accessibility and utilisation of ICTs among secondary school teachers in Kenya. In *The International Conference on Computing and ICT Research*. Uganda: Kampala pp.246-263.

Kiran, A., Zaman, L., & Naz, A. (2017). The Impact of internet, television and mobile phones on women's lives: Evidence from Pakistan. *Transylvanian Review*, 15(22), 1-13.

Kline, R. B. (2011). *Principles and practice of structural equation modeling*. New York: Guilford Press.

Kline, R. B. (2013). Exploratory and confirmatory factor analysis. In Y. Petscher, C. Schatschneider, & D. L. Compton (Eds), *Applied quantitative analysis education and the social sciences* (pp.171-207). New York, NY, USA: Routledge.

Kline, R. B. (2016). *Principles and practice of structural equation modelling* (4th ed.). New York, NY: The Guilford Press.

Krejcie, R. V., & Morgan, D. W. (1970). "Determining sample size for research activities". *Education and Psychological Measurement*, 30, pp. 607 -610.

Kreitner, R. & Kinicki, A. (1998). *Organisational behaviour*. Boston: McGraw-Hill.

- Kruger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for applied research* (3rd ed.). Thousand Oaks: Sage Publications Inc.
- Krysa, R. (1998). *Factors affecting the adoption and use of computer technology in schools*. Retrieved on April 15, 2020 from <http://www.usask.ca/education/coursework/802papers/krysa/krysa.PDF>
- Kushner, D. C., & MacLean, L. M. (2015). Introduction to the special issue: The politics of the nonstate provision of public goods in Africa. *Africa Today*, 62(1), 7-17.
- Latham, G. P. (2004). The motivational benefits of goal-setting. *Academy of Management Executive*, 18(4), 126–129. <http://doi.org/10.5465/AME.2004.15268727>
- Lavy, V. (2001). Estimating the effects of school time of instruction on student achievements. *Hebrew University Economics working paper*, 1(4), 1-35.
- Lee, L., Petter, S., Fayard, D., & Robinson, S. (2011). On the use of partial least squares path modeling in accounting research. *International Journal of Accounting Information Systems*, 12(4), 305 – 328.
- Leedy, P. & Ormrod, J. (2001). *Practical research planning and design* (7th Ed.). Merrill Prentice Hall and SAGE Publications, Upper Saddle River, NJ and Thousand Oaks, CA.
- Leedy, P., & Ormrod, J. (2005). *A handbook for teacher research from design to implementation*. New Jersey: Pearson Education.
- Leu, E., & Price-Rom, A. (2016). *Quality of education and teacher learning: A review of literature*. Retrieved on January 12, 2020 from <http://www.ibe.unesco.org/International/ICE47/English/Natregs/reports.pdf>.

- Lim, C., P. (2004). Learning technology in transition. *British Journal of Education and Technology*, 35(6), 747-759.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage Publications.
- Lindfors, E. (2007). ICT in teaching: European teachers' view. *ICT in Education: Reflections and Perspectives*.
<https://www.researchgate.net/publication/237833573>.
- Liu, S. (2006). Thinking of the ICT training of teachers in the school education information on construction. *Research on Teacher Education*, 21(2), 55-63.
- Locke, J. (1975). Of identity and diversity. In *Essay concerning human understanding*. Reprinted in John Perry John, 1975, *Personal identity*. Berkeley: University of California Press.
- Loevinger, J. (1957). Objective tests as instruments of psychological theory. *Psychological Reports*, 3(7), 635-694.
- Lohmoller, J. B. (1989). Latent variable path modeling with partial least squares path modeling in accounting research. *International of Accounting Information Systems*, 12(4), 305 – 328.
- Lu, I. R. R., Kwan, E., Thomas, D. R., & Cedzynski, M. (2011). Two new methods for estimating structural equation models: an illustration and comparison with two established methods. *International Journal of Research in Marketing*, 28(3), 258 – 268.
- Luszczynska, A., Gutierrez-Dona, B., & Schwarzer, R. (2005). General self-efficacy in various domains of human functioning: Evidence from five countries. *International Journal of Psychology* 40(2), 80-89.

- Machumu, H., Kimaro, A., & Almasi, M. (2018). ICT as a pedagogical tool in secondary schools teaching and learning: Policy and practices interplays. *EdMedia Innovation Learning*, 2, 1-7.
- Mackenzie, N., & Knipe, S. (2006). Research dilemmas: Paradigms, methods and methodology. *Issues in Educational Research*, 16(2), 1-11.
- Maicibi, N. A. (2003). *Pertinent issues in employees management*. Kampala: MPK Graphics (U) Ltd.
- Maiklad, C. (2001). *The beliefs and practices of Thai English language teachers*. Unpublished PhD thesis. University of Exeter, UK.
- Malcolm, E., & Godwyll, F. (2015). Diffusion of information communication technology in selected Ghanaian schools. *Diffusion of ICTs in Education*, Ohio University, 1-29.
- Marcelo, C. & Yot-Domínguez, C. (2019). From chalk to keyboard in higher education classrooms: changes and coherence when integrating technological knowledge into pedagogical content knowledge. *Journal of Further and Higher Education*, 43(7), 975-988.
- Marvasti, A. B. (2004). *Qualitative research in sociology: An introduction*. Sage Publications Inc.
- Maslow, A. H. (1965). Religions, values, and peak-experiences. *Journal for the Scientific Study of Religion*, 5, 179. <http://doi.org/10.2307/1384286>
- Maslow, A. H. (1970b). *Religions, values, and peak experiences*. New York: Penguin.
- Mayoh, J. & Onwuegbuzie, A. J. (2014). Surveying the landscape of mixed methods phenomenological research. *International Journal of Multiple Research Approaches*, 8(1), 1 - 12.

- McKeachie, W. J. (1999). *Teaching tips strategies research and theory for college and university teachers*. New York: Houghton Mifflin Company.
- McShane, S. L., & Von Glinow, M. A. (2015). *Organisational behaviour: Emerging knowledge, global reality, Seventh Edition*. Singapore: McGraw-Hill Education.
- Melby, C. S. (1994). *Ghana primary school development*. Ghana Publishing Corporation, Accra.
- Memon, M. A., Ting, H., Hwa, C. J., Ramayah, T., Chuah, F., & Cham, T. H. (2020). Sample size for survey research: Review and recommendations. *Journal of Applied Structural Equation Modeling*, 4(2), 1 – 20.
- Mereku, K. D., Yidana, I., Hordzi, W. H. K., Tete-Mensah, I., & Williams, J. B. (2009). *Pedagogical integration of ICT: Ghana Report*. Retrieved on 20 – 04-2010 [www.ernwaca.org/panaf/pdf/phase-1/Ghana PanAf_Report.pdf](http://www.ernwaca.org/panaf/pdf/phase-1/Ghana_PanAf_Report.pdf)
- Mertens, D. M. (2014). *Evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods*, (4th ed.). London, UK: SAGE Publications Inc.
- Mikre, F. (2011). The role of information communication technologies in education: Review article with emphasis to the computer and internet. *Ethiopia Journal of Education and Science*, 6(2), 18-34.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded source book* (2nd ed.). Sage Publications.
- Miltenberger, R. G. (2001). *Behaviour modification: Principles and procedures* (2nd ed.). Wadsworth/Thomson Learning.
- Ministry of Education, Youth and Sports (MOEYS) (2004). White paper on the report of the educational reform review committee, Accra: MOEYS.

- Mirriam, S. B. (2014). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.
- Mishra, S., Shama, M., Shama, R., C., Singh, A., & Thakur, A. (2016). Development of a scale to measure faculty attitude towards open educational resources. *Open Praxis* 8(1), 55-69.
- Mitchell, T. R. (1982). Motivation: New directions for theory, research and practice. *Management Review*, 7(1), 80-88.
- MoE JHS Syllabus (2008). *ICT syllabus for junior high school year 1-3*.
- MoE Primary School Syllabus (2008). *ICT syllabus for primary six*.
- Morgan, D. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, 1(1), 48-76.
- Morrison, H. C. (1934). *Basic principles in education*. Houghton Mifflin Company.
- Moses, P., Bakar, K. A., Mahmud, R., & Wong, S. L. (2012). ICT infrastructure, technical and administrative support as correlates of teachers' laptop use. *Procedia-Social and Behavioural Sciences*, 59, 709-714.
- Mozael, M., Dong, S. D., Tse, B. H., & Al-Sharab, J. F. (2017). *On the morphologies and photocatalytic properties of TiO₂ nanoparticles synthesised by pulsed-laser decomposition of Titanium Tetraisopropoxide*. Cambridge University Press.
- Mullins, L. (2007). *Organisational behaviour*. (4th ed.), Pearson Education, New York.
- Mumanyire, M. (2005). *Factors affecting teacher motivation in secondary schools in Mukono district*. Unpublished Master of Education dissertation, Makerere University, Kampala, Uganda.

- Murithi, J., & Yoo, J. E. (2021). Teachers' use of ICT in implementing the competency-based curriculum in Kenyan public primary schools. *Innovation and Education*, 3(5), 1-11.
- Murphy, K. R. (2008). Explaining the weak relationship between job performance and ratings of job performance. *Industrial and Organisational Psychology: Perspectives on Science and Practice*, 1(2), 148-160.
- NaCCA, (2018). Courier innovative training network 'new approaches in the conservation of contemporary art'. *Cologne Institute of Conservation Sciences, TH Koln, Summer School for the Marie Sklodowska*.
- Natia, J., & Al-hassan, S. (2015). Promoting teaching and learning in Ghanaian basic schools through ICT. *International Journal of Education and Development using ICT*, 11(2), 56 – 68.
- National Education Association (NEA, 1960). Small-sample techniques. *Research Bulletin*, 38, 99.
- Newson, R. (2015). A mixed methods study of the factors that influence whether intervention research has policy and practice impacts: Perception of Australian researchers. *BMJ Open*, 5(7), 49 -55.
- Nilsen, A. B., & Albertalli, G. (2002). *Introduction to learning and teaching infants through elementary age children*. New York: Delmar.
- Obiri-Yeboah, K., Owusu-Kwarteng, K., & Kyere-Djan, R. (2013). Factors affecting ICTs adoption in tertiary institutions in Ghana: A case of Kwame Nkrumah University of Science and Technology. *Information and Knowledge Management* www.iiste.org
- Obota, B. N., Oluoch, S. E., & Makani, L. (2015). An assessment of the availability of ICT Infrastructure for curriculum instruction in public secondary schools in

- Mumias Sub-County, Kenya. *Journal of Research & Method in Education*, 5(1), 52-57.
- Ofodu, G. O. (2007). Nigeria literary educators and their technological needs in a digital age. *Education Focus*, 1(1), 22-30.
- Okongo, R. B., Ngao, G., Rop, N. K., & Nyongesa, W. J. (2015). Effects of availability of teaching and learning resources on the implementation of inclusive education in pre-school centres in Nyamira North Sub-County, Nyamira County, Kenya. *Journal of Education and Practice*, 6(35), 132-141.
- Orodho, J. A. (2013). Progress towards attainment of education for all among nomadic pastoralists: Do home-based variables make a difference in Kenya? *Research on Humanities and Social Sciences* pages 54-67. www.iiste.org.
- Orodho, J., A., Waweru, P. N., & Thinguri, M. (2013). Basic education in Kenya: Focus on strategies applied to cope with school-based challenges inhibiting effective implementation of curriculum. *International Journal of Education and Research*, 1(11), 1-10.
- Osamwonyi, E., F. (2016). In-service education of teachers: Overview, problems and the way forward. *Journal of Education and Practice*, 7(26), 83-87.
- Osuala, E. C. (1982). *Introduction to research methodology*. Africana-FEP Publishers.
- Oti-Agyen, P. (2007). *The development of education in Ghana*. Kumasi: Hannob Press.
- Owusu-Mensah, F. (2006). *Learner support for university distance education in Ghana: A study of students' and providers' perceptions*. Unpublished doctoral thesis, University of Nottingham.
- Oxford English Dictionary, 2018.

- Pansiri, J. (2005). Pragmatism: A methodological approach to researching strategic alliances in tourism. *Business Tourism and Hospitality Planning & Development*, 2(3), 45-61.
- Pascal, L. E., True, L. D., Campbell, E.W. D., Risk, M., Coleman, M., Eichner, L. J., Nelson, P. S., & Liu, A. Y. (2008). Correlation of mRNA and protein levels: Cell type-specific gene expression of cluster designation antigens in the prostate. *BMC Genomics*, 9(246), 1-13.
- Patton, M. Q. (2015). *Qualitative evaluation and research methods*. (4th ed.). Thousand Oaks Sage Publications.
- Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers and Education*, 37(2), 163-178.
- Pelgrum, W. J., & Law, N. (2003). *ICT in Education around the World: Trends, Problems and Prospects*. UNESCO-International Institute for Educational Planning.
- Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research". *Journal of Operations Management*, 30(6), 467 – 480.
- Peprah, O. M. (2016). ICT education in Ghana: An evaluation of challenges associated with the teaching and learning of ICT in basic schools in Atwima Nwabiagya District in Ashanti Region. *European Journal of Alternative Education Studies*, 1(2), 8-27.
- Peter, J. P., & Churchill, G. A. (1986). Relationships among research design choices and psychometric properties of rating scales: A meta-analysis. *Journal of Marketing Research*, 23, 1- 10.

- Popa, D. & Topala, L. R. (2018). Students' digital competences, related attitudes and self-directed learning. *The International Scientific Conference E-Learning and Software for Education*, 3, 9 - 95.
- Prensky, M. (2001). Digital natives, digital immigrants, Part 1. *On The Horizon*, 9, 3-6.
- Quaicoo, J. S., & Pata, K. (2015). Factors determining digital divide in Ghana's basic schools. In: Cunningham, P. and Cunningham, M. (Eds.) *IST-Africa 2015 Conference Proceedings*. Pp.4 – 11 IST-Africa, Lilongwe (2015).
- Rafiee, M. & Abbasian-Nagheh, S. (2019). E-learning: development of a model to assess the acceptance and readiness of technology among language learners. *Computer Assisted Language Learning*, 34(2), 1-21.
- Raja, A. G. K., Furgan, A. K., & Khan, M. A. (2011). Impact of training and development on organizational performance. *Global Journal of Management and Business Research*, 11(7), 1-7.
- Raja, Aon organizational, G., Furqan, A., K., & Khan, M., A. (2010). Impact of training and development on organizational performance. *Global Journal of Management and Business Research*, 11(7), 1-7.
- Renner, B., Kwon, S., Yang, B. H., Paik, K. C., Kim, S.H., Roh, S., Song, J., & Schwarzer, R. (2008). Social-cognitive predictors of dietary behaviour in South Korean men and women. *International Journal of Behavioural Medicine*, 15(1), 4-13.
- Republic of Kenya/UNICEF (2012). Education for all (EFA), *End of Decade Assessment* (2001-2010). Ministry of Education and UNICEF. Nairobi.
- Riedl, M. & Stern, A. (2006). Believable agents and intelligent story adaptation for interactive storytelling. In: Gobel, S., Malkewitz R., Iurgel I. (Eds.) *Techologies*

- for Interactive Digital Storytelling and Entertainment*. TIDSE 2006. 4326.
Springer, Berlin, Heidelberg. <https://doi.org/10.1007/11944577-1oe>.
- Rigdon, E. E. (2014). Rethinking partial least squares path modeling: breaking chains and forging ahead. *Long Range Planning*, 47(3), 161 – 167.
- Ringle, C. R., Sarstedt, M., & Straub, D. W. (2012). A critical look at the use of PLS-SEM in MIS quarterly. *MIS Quarterly* 36(1), 1- 20.
- Rogers, E. M. (1994). *A history of communication study: A biographical. approach*. New York: The Free Press.
- Rohatgi, A., Scherer, R., & Hatlevik, O. E. (2016). The role of ICT self-efficacy for students' ICT use and their achievement in a computer and information literacy test. *Computers and Education*, 102, 305-321.
- Roseman, G. B., & Ralis, S. F. (2012). *Learning in the field: An introduction to qualitative research* (3rd ed.). Sage, Los Angeles.
- Saade, R. G. & Kira, D. (2007). Computer anxiety in e-learning: The Effect of computer self-efficacy. *Journal of Information Technology Education*, 8, 177-191.
- Sadegül, A. A. (2006). Complexity of integrating computer technologies into education in Turkey. *Journal of Educational Technology & Society*, 9(1), 176-187.
- Salehi, H., & Salehi, Z. (2012). Integration of ICT in language teaching: Challenges and barriers. Proceedings of the 3rd International Conference on e-Education. *e-Business, e-Management and e-Learning (ICA4E, 2012)*, IPEDR, 27, 215-219.
- Sam, F. K., Dzakpasu, R. & Ayikue, M. A. (2020). *Organizing and managing of educational resources*. Kumasi Catholic Press Ltd, Kumasi, Ghana.
- Sánchez-García, A., Mena-Marcos, J., Guanlin, H., & Escribano, P. (2013). Teacher development and ICT: The effectiveness of a training programme for in-service school teachers. *Procedure- Social and Behavioural Sciences*, 2(7), 529-534.

- Sarbeng, I. B. (2013). Staff training and development interventions and teaching performance: Application of structural equation modeling. *International Journal of Human Resource Studies*, 3(4), 159-176.
- Sarfo, F. K., & Ansong-Gyimah, K. (2011). Ghanaian senior high school students' access to and experiences in the use of information and communication technology. *Education in technological world: Communicating current and emerging research and technological effort*. Formatex Research Centre, Spain, 216-222.
- Sarfo, F. K., & Elen, J. (2008). Instructional science: *An International Journal of the Learning Sciences* 36(2), 137-153.
- Sarfo, F. K., Amankwah, F., & Konin, D. (2017). Computer self-efficacy among senior high school teachers in Ghana and the functionality of demographic variables on their computer self-efficacy. *The Turkish Online Journal of Educational Technology*, 16(1), 19-31.
- Sarfo, F. K., Amankwah, S., Oti-Agyin P., & Yidana, I. (2016). Information and communication technology access and use and competency level among second cycle-cycle school teachers in Ghana. *Journal of Medial and Communication Studies*, 8(5), 43-51. Doi: 10.5897/JMCS2016.0495.
- Saunders, M., Lewis, P., & Thornhill, A. (2007). *Research methods for business students* (4th ed.). London: Financial Times Prentice Hall.
- Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students*. Pearson Education Ltd., Harlow.
- Sava, L. A. & Orodho, J. A. (2014). Socio-economic factors influencing pupils' access to education in informal settlements: A case of Kibera, Nairobi County, Kenya. *International Journal of Education and Research*, 12(3), 1-16.

- Schlechy, A. (2004). *The art of teaching*. New York: Prentice Hall Inc.
- Schoepp, K. (2005). Barriers to technology integration in a technology-rich environment. *Learning and Teaching in Higher Education: Gulf Perspectives*, 2(1), 1 - 24.
- Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modelling and confirmatory factor analysis results: A review. James B. Schreiber Journal. *Journal of Educational Research*, 2(4), 55-71.
- Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational Psychologist*, 27, 207-231.
- Schunk, D. H. (2005). Self-regulated learning: The educational legacy of Paul R. Pintrich. *Educational Psychologist*, 40(2), 85–94.
http://doi.org/10.1207/s15326985ep4002_3
- Schunk, D. H., & Zimmerman, B. J. (2007). Influencing children’s self-efficacy and self-regulation of reading and writing through modeling. *Reading and Writing Quarterly*, 23, 7-25.
- Shaheen, A., Naqvi, S. M. H., & Khan, M. A. (2013). Employees training and organisational performance: Mediation by employees performance. *Interdisciplinary Journal of Contemporary Research in Business*, 5(4), 490-503.
- Sharma, R. (2003). Barriers in using technology for education in developing countries', IEEE0-7803-7724-9103. Singapore schools. *Computers & Education*, 41(1), 49-63.

- Shiue, Y. M. (2007). Investigating the sources of teachers' instructional technology use through the decomposed theory of planned behaviour. *Journal of Educational Computing Research*, 36(4), 425-453.
- Shulman, L. S. (1987). "Knowledge and teaching: Foundations of the new reform". *Harvard Educational Review*. London: Harvard University Press.
- Siann, G., Lightbody, P., Stocks, R., & Walsh, D. (1996). Motivation and attribution at secondary school: The role of gender. *Educational Studies*, 22(1), 13-25.
- Small, M. L. (2011). How to conduct a mixed methods study: Recent trends in a rapidly growing literature. *Annual Review of Sociology*, 37, 57-86.
- Smith, B. O. (1963). A conceptual analysis of instructional behaviour1. *Journal of Teacher Education*, 3, 36-54.
- Smith, M. K. (2004). *Educational development in Ghana*. Unimax Publishers, Accra.
- Stenhouse, L. (1975). *An introduction to curriculum research and development*. London: Heinemann.
- Stevens, S. S. (1946). On the theory of scales of measurement. *Science*, 103(2684), 677-680.
- Tabachnick, B. G., Fidell, L. S. (2013). *Using multivariate statistics (6th ed.)*. Boston: Pearson.
- Taber, C. (2008). Using selection on observed variables to assess bias from unobservables when wvaluating swan-ganz catheterization. *American Economic Review: Papers and Proceedings*, with Joseph Altonji and Todd Elder.
- Tashakkori, A., & Teddle, C. (2010). Putting the human back in "human research methodology": The researcher in mixed methods research. *Journal of Mixed Methods Research*, 4(4), 271 -277.

- Tay, L., & Jebb, A. (2017). Scale development. In S. Rogelberg (Ed), *The SAGE Encyclopedia of industrial and organisational psychology*, (2nd ed.) Thousand Oaks, CA: Sage.
- Tenenhaus, A. & Tenenhaus, M. (2011). Regularised generalised canonical correlation analysis. *Psychometrika*, 76(2), 257-257.
- Teo, T., & Koh, J. H. L. (2010). Assessing the dimensionality of computer self-efficacy among pre-service teachers in Singapore: A structural equation modelling approach. *International Journal of Education and Development using Information and Communication Technology*, 6(3), 7-18.
- Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behaviour*, 52, 145-161.
- Thorndike, E. L. (1928). "Curriculum research". *School and Society*, 18, 569 – 576.
- Tomic, W. (1993). Behaviourism and cognitivism in education. *Psychology*, 30(3/4), 38-46.
- Tring, A. S. (2001). *Education, manpower and economic growth*. New York: McGraw Hill.
- Turkson, J. K. (2007). *Business management for secondary and tertiary students*. (2nd ed.). Kumasi, Ghana: Jakentee Management Research Centre.
- UNESCO (2002). *Information and communication technology in education - A curriculum for schools and programme for teacher development*. Paris: UNESCO.
- UNESCO Science Report (2010). The current status of science around the world. <https://doi.org/10.18356/9789210059060>.
- UNESCO, (2004). *Integrating ICTs into education: Lessons learned*. Bangkok, Thailand: UNESCCO Asia and Pacific Regional Bureau for Education.

- Unwin, T. (2005). Towards a framework for the use of ICT in teacher training in Africa. *Open-Learning: The Journal of Open, Distance and e-Learning*, 20(2), 113-129.
- Vail, P. B. (1996). *Learning as a way of being: Strategies for survival in a world of permanent white water*. San Francisco, CA. Josey-Bass.
- Van Weert, T. (2002). *Information and Communication technology in education: a curriculum for schools and programmes of teacher development*. UNESCO. France: Paris.
- Vanderline, R., & van Braak, J. (2010). "The e-capacity of primary schools: Development of a conceptual model and scale construction from a school improvement perspective". *Computers & Education*, 55(2), 541-553.
- Vlasova, V., Simonova, G., & Soleymani, N. (2016). Pedagogical support components of students' social adaption. *International Journal of Environmental and Science Education*, 11(15), 641-653.
- Vroom, V. H. (1964). *Work and motivation*. London: Willey.
- Walsh, T. R. (2005). *Fighting words and feuding words*. Lanham, MD.: University Press.
- Walter, M. (2006). *Social science methods: An Australian perspective*. Oxford, New York: Oxford University Press.
- Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education* 36(3), 231-250.
- Watson, J. B. (1980). Psychology as the behaviourist view it. *Scholarly Journal*, 3(3), 272-281.

- Wijayasundara, M. (2020). Integration of ICT in teaching and learning in schools. *Journal of Research on Technology in Education* 3(3), 41-56.
- Wikipedia.
- Williams, J. (2005). Designing neighbourhoods for social interaction – the case of Co-housing. *Journal of Urban Design* 10(3), 195-227. ISSN: 1357-4809.
- Wilson, J. (2010). *Essentials of business research – A guide to doing your research project*. New Delhi: SAGE Publications India Pvt Ltd.
- Wold, H. (1982). Soft modelling: The basic design and some extensions”, in *systems under indirect observation: Part II*, K. G. Joreskog and H. Wold (Eds.), Amsterdam: North-Holland, pp. 1 – 54.
- World Bank, (2013). *Annual report*. Retrieved on March 16, 2020 from <https://doi.org/10.1596/9778-0-8213-9937-8>
- Worlddata.info.
- Yara, P. O., & Otieno, K. O. (2010). Teaching/learning resources and academic performance in mathematics in secondary schools in Bondo District of Kenya. *Asian Social Science*, 6(12), 127-132.
- Yildirim, A., & Simsek, H. (2006). *Research methods in Social Sciences*. Ankara: Seckin Yayincilik.
- Yilmaz, K. (2013). Comparison of quantitative and qualitative research traditions: epistemological, theoretical, and methodological differences. *European Journal of Education*, 48(2), 311-325
- Yilmaz, O. (2017). Learner centred classroom in science instruction: Providing feedback with technology integration. *International Journal of Research in Education and Science*, 3(2), 604-613.

- You, Z. (2010). *Literature review of teacher training education information environment*. Retrieved from <http://it.ccnu.edu.cn/aspblog/blog/u/412/archives/2010/4456.html> on May 19, 2020.
- Yunus, M. M., Nordin, N., Salehi, H., & Embi, M. A. (2014). Future of ICT as a pedagogical tool in ESL teaching and learning. *Research Journal of Applied Sciences, Engineering and Technology*, 7(4), 764-770.
- Yusif, H., & Yussof, I. (2010). A critical review of recent trends in basic and secondary schools' enrolments in Ghana. *Journal of Science and Technology*, 30(1), 82-94.
- Zhao, G. (2005). *China education development survey*. China Education Report. Retrieved on February 9, 2020 from <http://anitawyyq.bokee.com/1723853.html>.
- Zmescience.Com.
- Zukauskas, P., Vveinhardt, J., & Andriukaitiene, R. (2017). Philosophy and paradigm of scientific research. *Management Culture and Corporate Social Responsibility*, 1(2), 15-37.

APPENDIX A
STUDY REGIONS AND DISTRICT/MUNICIPAL/METROPOLITAN
ASSEMBLIES

APPENDIX B

SURVEY QUESTIONNAIRE FOR THE STUDY

QUESTIONNAIRE FOR ASSESSING PEDAGOGICAL SUPPORT FOR ICT IN TEACHING AND LEARNING OF ICT IN BASIC SCHOOLS IN GHANA

DEPARTMENT OF EDUCATIONAL LEADERSHIP
SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION,
WINNEBA

Dear Respondent,

ICT education has now become part of the Ghanaian educational curriculum, from basic to tertiary level. One important issue of concern in ICT education is the provision of adequate pedagogical support for ICT to implementing schools for the effective teaching and learning of the programme. The purpose of this survey is to find out your assessment of the pedagogical support for ICT available to basic schools in Ghana for the teaching and learning of the ICT programme. It is my hope that it will normally take between 20-25 minutes of your time to complete the attached questionnaire. Please answer the questions as objectively as possible. I consider your contribution to be highly valuable to this research. Please be assured that any information you provide will be treated as completely confidential. For this reason, you are kindly requested not to write your name on the questionnaire.

I am grateful to you for agreeing to spend some of your valuable time to complete this questionnaire. It is hoped that your effort will contribute to the success of this study. Thank you.

Caiphas Kwame Kenney
Ph.D. Student

Email: kwamekenney@gmail.com; Mobile 0243036223

Principal Supervisor: Prof. F. K. Sarfo
Vice-chancellor, Akenten Appiah-Menka University of
Skills Training and Entrepreneurial Development (AAMUSTED),
Ghana

Co-Supervisor: Stephen Baafi-Frimpong (Ph.D).
Senior Lecturer
Department of Education and Psychology
University of Cape Coast
Ghana

Commented [WU12]: The study is not about only rural basic schools

SECTION A: RESPONDENT'S BACKGROUND INFORMATION

Please select your response by ticking ✓ the appropriate box []

B1. Type of respondent [] ICT Teacher [1] [] ICT student [2]

B2. Basic school category [] Primary [1] [] JHS [2]

B3. In which region is your school located?

[] Western [1]

[] Central [2]

[] Ashanti [3]

[] Bono [4]

[] Northern [5]

[] Upper West [6]

[] Eastern [7]

[] Upper East [8]

[] Volta [9]

[] Greater Accra [10]

B4. In which district, municipal or metropolitan is your school located?

[] Wasa-Amanfi District [1]

[] Cape Coast Metropolitan [2]

[] Atwima Nwabiagya Municipal [3]

[] Wenchi Municipal [4]

[] Tamale Metropolitan [5]

[] Jirapa Municipal [6]

[] Yilo Krobo Municipal [7]

[] Pusiga District [8]

[] Ho Municipal [9]

[] Ningo-Prampam District [10]

Commented [WU13]: Are you not interested in knowing districts or municipalities?

B5. What is your gender? [] Male [1] [] Female [2]

B6. What is your age group?

[] 10 and below [1]

[] 11-20 [2]

[] 21-30 [3]

[] 31-40 [4]

[] 41-50 [5]

[] 51-59 [6]

[] 60 and above [7]

B7. For how many years have you been in this school as a teacher or student?

[] 3 years and below [1]

[] 4 - 6 years [2]

[] 7 -9 years [3]

[] 10 years and above [4]

Commented [WU14]: Are you not interested in knowing districts or municipalities?

SECTION B: ICT INFRASTRUCTURE

Indicate the extent to which you agree ICT infrastructure support is available in your school to facilitate the teaching and learning of the ICT programme.

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A

[5] Strongly Agree, SA

Response

NO	ICT INFRASTRUCTURE	1	2	3	4	5
i8	There is computer laboratory in the school.					
i9	There are available functional computers in the school.					
i10	There are adequate computers in the school.					
i11	Computers are installed with enough application software /programmes for ICT teaching and learning eg. MS Word, Excel, Power Point, etc.					
i12	School computers are connected to the internet.					
i13	There is access to Wifi internet service in the school.					
i14	There are projectors in the school for ICT teaching and learning.					
i15	There is Smart board technology in the school for ICT teaching & learning.					
i16	There is mobile network connectivity/service in the school.					
i17	There is an installed line telephone in the school.					
i18	There is a satellite system in the school.					

SECTION C: PARTICIPATION IN ICT TRAINING PROGRAMMES

Indicate the extent to which you agree you are supported to participate in ICT training programmes to acquire, upgrade or update your knowledge and skill in ICT while in this school.

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A

[5] Strongly Agree, SA

Response

NO	PARTICIPATION IN ICT TRAINING PROGRAMMES	1	2	3	4	5
tr19	You receive support to participate in ICT public lectures to acquire, upgrade or update your ICT knowledge and skills					
tr20	You receive support to participate in ICT symposia to acquire, upgrade or update your ICT knowledge and skills					
tr21	You receive support to participate in ICT seminars to acquire, upgrade or update your ICT knowledge and skills.					

tr22	You receive support to participate in ICT conferences to acquire, upgrade or update your ICT knowledge and skills.						
tr23	You receive support to participate in ICT workshops to acquire, upgrade or update your ICT knowledge and skills.						

SECTION D: FACILITYYY, RESOURCE FOR TEACHING & LEARNING

Indicate the extent to which you agree there is support for the provision of Facility or Resource for ICT teaching and learning in your school.

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A [5] Strongly Agree, SA

Response

NO	TEACHING/LEARNING FACILITIES	RESOURCES	AND	1	2	3	4	5
f/r24	Availability of classroom for ICT lessons							
f/r25	Adequacy of classroom for ICT lessons							
f/r26	Availability of tables and chairs in the classrooms for teachers and students to use during ICT lessons							
f/r27	Availability of ICT syllabus in the school							
f/r28	Availability of ICT textbooks for teachers							
f/r29	Availability of ICT textbooks for students							
f/r30	Provision of teachers notebook for ICT lesson plan and teaching notes							
f/r31	Provision of notebook for students ICT notes							
f/r32	Provision of exercise book for students ICT exercises							
f/r33	Provision of writing materials for teachers – Whiteboard marker, chalk, blue & red pen							
f/r34	Provision of writing materials for students – pen, pencil							
f/r35	Availability of drawing charts for ICT lesson illustration							
f/r36	Availability of computers for ICT lessons							
f/r37	Availability of interactive boards for ICT lessons							

SECTION E: INCENTIVES FOR TEACHING AND LEARNING ICT

Indicate the extent to which you agree incentive support is provided for the teaching and learning of ICT in the school.

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A [5] Strongly Agree, SA

Response

NO	INCENTIVE/MOTIVATIONAL SUPPORT	1	2	3	4	5
in38	There is in place award/prize for best ICT teachers in the school.					
in39	There is in place award/prize for best ICT students in the school.					
in40	Government pays special allowance to teachers who teach ICT in the school.					
in41	Teachers who teach ICT in the school are given free accommodation.					
in42	ICT teachers in the school are provided with laptop to motivate them teach.					
in43	Students in the school are provided with laptop to motivate them learn ICT.					
in44	Teachers provide extrinsic motivation such as praise, gift etc. to motivate students learn ICT.					
in45	There is recognition for students' achievement in ICT					
in46	There are opportunities for INSET for ICT teachers					

SECTION F: EFFECTIVENESS OF ICT TEACHING

Indicate the extent to which teachers are able to effectively perform their ICT teaching roles considering the support available in your school for the teaching and learning of the ICT programme. Use the scale below from [1] lowest rating to [7] highest rating.

Response Scale

- Very Lesser Extent [VLE] =1
- Much Lesser Extent [MLE] =2
- Lesser Extent [LSRE] =3
- Not Certain [NC] =4
- Less Extent [LE] =5
- Much Extent [ME] =6
- Very Much Extent [VME] =7

Response

N O	EFFECTIVENESS OF ICT TEACHING	Response						
		1	2	3	4	5	6	7
t51	Teacher is able to prepare ICT scheme of work.							
t52	Teacher is able to prepare lesson plan for ICT.							
t53	Teacher is able to prepare ICT lesson order.							
t54	Teacher is able to prepare ICT teaching notes.							
t55	Teacher is able to deliver /present ICT lessons.							
t56	Teacher is able to provide appropriate ICT content knowledge to students during lessons.							
t57	Teacher is able to teach and involve students in ICT practical lessons.							
t58	Teacher appropriately answers students questions during ICT lessons.							
t59	Teacher appropriately motivates students during ICT lessons.							
t60	Teacher is able to prepare ICT questions for students' assessment – tests, quizzes, class exercises, etc.							
t61	Teacher is able to appropriately score students ICT assessment task.							
t62	Teacher is able to appropriately grade and evaluate/judge students' performance in ICT.							

Commented [WU15]:

Commented [WU16R15]:

SECTION G: EFFECTIVENESS OF ICT LEARNING

Indicate the extent to which students are able to effectively perform their ICT learning roles considering the support available in your school for the teaching and learning of the ICT programme. Use the scale below from [1] lowest rating to [7] highest rating.

Response Scale

Very Lesser Extent [VLE] =1

Much Lesser Extent [MLE] =2

Lesser Extent [LSRE] =3

Not Sure [NS] =4

Less Extent [LE] =5

Much Extent [ME] =6

Very Much Extent [VME] =7

EFFECTIVENESS OF ICT LEARNING	Response						
	1	2	3	4	5	6	7
l63 Students are motivated for/to have ICT lessons (readiness/preparedness for ICT lessons).							
l64 Students are able to follow ICT lessons in class.							
l65 Students are able to ask questions during ICT lessons.							
l66 Students are able to answer questions appropriately during ICT lessons.							
l67 Students co-operate in class during ICT lessons.							
l68 Students are prepared to have practical ICT lessons.							
l69 Students are prepared for theoretical ICT lessons.							
l70 Students prepare/write notes during ICT lessons.							

171 Students are able to read/study their notes and learn other ICT books, materials, tools and technologies.								
172 Students are prepared to participate in assessment in ICT - class exercises, quizzes, tests, etc.								
173 Students are able to perform well in ICT assessment - class exercises, quizzes, tests, etc.								
174 Students feel satisfied with their performance in ICT content/theoretical knowledge.								
175 Students feel satisfied with their practical ICT knowledge.								

SECTION H: SELF-EFFICACY OF ICT USE

Indicate the level/degree you believe in your ICT self-efficacy in the school considering the available pedagogical support for ICT in your school for the teaching and learning of the ICT curriculum based on the adapted “Computer Self-Efficacy Scale” (CSE) developed by Teo & Koh (2010).

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A

[5] Strongly Agree, SA

Response

NO	Subscale/items: LEVEL OF SELF-EFFICACY OF ICT USE	1	2	3	4	5
	Basic Computer Skills (BCS) / Basic ICT Skills (BICTS)					
se76	I am able to use word processor (MS Word) to create, edit and format documents for specific purposes.					
se77	I am able to use the internet to search for information and resources.					
se78	I am able to use email for communication.					
se79	I am able to use presentation software (Power Point) for delivery, eg. lesson or other presentation tasks.					
se80	I am able to use spreadsheet (Excel) to record data, compute simple calculations and represent data in the form of tables and graphs.					
	Media Related Skills (MRS)					
se81	I am able to use graph editors to create resources for teaching or learning.					
se82	I am able to use video editing software.					
se83	I am able to use website editors to create and/or modify web pages.					
	Web Based Skills (WBS)					

se84	I am able to use conferencing software for collaboration purposes.						
se85	I am able to use a learning management system to support my teaching or learning.						

Thank you very much for your time and co-operation

APPENDIX B1

THE 25 ITEMS THAT PASSED VALIDITY AND RELIABILITY TEST FOR USE IN THE ACTUAL ANALYSIS

SECTION B: ICT INFRASTRUCTURE

Indicate the extent to which you agree ICT infrastructure support is available in your school to facilitate the teaching and learning of the ICT programme.

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A
[5] Strongly Agree, SA

Response

NO	ICT INFRASTRUCTURE	1	2	3	4	5
i8	There is computer laboratory in the school.					
i10	There are adequate computers in the school.					
i11	Computers are installed with enough application software /programmes for ICT teaching and learning eg. MS Word, Excel, Power Point, etc.					

SECTION C: PARTICIPATION IN ICT TRAINING PROGRAMMES

Indicate the extent to which you agree you are supported to participate in ICT training programmes to acquire, upgrade or update your knowledge and skill in ICT while in this school.

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A
[5] Strongly Agree, SA

Response

NO	PARTICIPATION IN ICT TRAINING PROGRAMMES	1	2	3	4	5
tr21	You receive support to participate in ICT seminars to acquire, upgrade or update your ICT knowledge and skills.					
tr22	You receive support to participate in ICT conferences to acquire, upgrade or update your ICT knowledge and skills.					
tr23	You receive support to participate in ICT workshops to acquire, upgrade or update your ICT knowledge and skills.					

SECTION D: FACILITY, RESOURCE FOR TEACHING & LEARNING

Indicate the extent to which you agree there is support for the provision of Facility or Resource for ICT teaching and learning in your school.

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A [5] Strongly Agree, SA

Response

NO	TEACHING/LEARNING FACILITIES AND RESOURCES	1	2	3	4	5
f/r24	Availability of classroom for ICT lessons					
f/r25	Adequacy of classroom for ICT lessons					
f/r26	Availability of tables and chairs in the classrooms for teachers and students to use during ICT lessons					
f/r31	Provision of notebook for students ICT notes					
f/r32	Provision of exercise book for students ICT exercises					
f/r34	Provision of writing materials for students – pen, pencil					

SECTION E: INCENTIVES FOR TEACHING AND LEARNING ICT

Indicate the extent to which you agree incentive support is provided for the teaching and learning of ICT in the school.

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A [5] Strongly Agree, SA

Response

NO	INCENTIVE/MOTIVATIONAL SUPPORT	1	2	3	4	5
in38	There is in place award/prize for best ICT teachers in the school.					
in40	Government pays special allowance to teachers who teach ICT in the school.					
in42	ICT teachers in the school are provided with laptop to motivate them teach.					

SECTION F: EFFECTIVENESS OF ICT TEACHING

Indicate the extent to which teachers are able to effectively perform their ICT teaching roles considering the support available in your school for the teaching and learning of the ICT programme. Use the scale below from [1] lowest rating to [7] highest rating.

Response Scale

- Very Lesser Extent [VLE] =1
- Much Lesser Extent [MLE] =2
- Lesser Extent [LSRE] =3
- Not Certain [NC] =4
- Less Extent [LE] =5
- Much Extent [ME] =6
- Very Much Extent [VME] =7

Response

N O	EFFECTIVENESS OF ICT TEACHING	1	2	3	4	5	6	7
		t52	Teacher is able to prepare lesson plan for ICT.					
t54	Teacher is able to prepare ICT teaching notes.							
t55	Teacher is able to deliver /present ICT lessons.							

Commented [WU17]:

Commented [WU18R17]:

SECTION G: EFFECTIVENESS OF ICT LEARNING

Indicate the extent to which students are able to effectively perform their ICT learning roles considering the support available in your school for the teaching and learning of the ICT programme. Use the scale below from [1] lowest rating to [7] highest rating.

Response Scale

- Very Lesser Extent [VLE] =1
- Much Lesser Extent [MLE] =2
- Lesser Extent [LSRE] =3
- Not Sure [NS] =4
- Less Extent [LE] =5
- Much Extent [ME] =6
- Very Much Extent [VME] =7

Response

EFFECTIVENESS OF ICT LEARNING	1	2	3	4	5	6	7
164 Students are able to follow ICT lessons in class.							
169 Students are prepared for theoretical ICT lessons.							
172 Students are prepared to participate in assessment in ICT - class exercises, quizzes, tests, etc.							

SECTION H: SELF-EFFICACY OF ICT USE

Indicate the level/degree you believe in your ICT self-efficacy in the school considering the available pedagogical support for ICT in your school for the teaching and learning of the ICT curriculum based on the adapted “Computer Self-Efficacy Scale” (CSE) developed by Teo & Koh (2010).

Use the scale below from [1] lowest rating to [5] highest rating.

[1] Strongly Disagree, SD [2] Disagree, D [3] Not Certain, NC [4] Agree, A
[5] Strongly Agree, SA

Response

NO	Subscale/items: LEVEL OF SELF-EFFICACY OF ICT USE	1	2	3	4	5
	Basic Computer Skills (BCS) / Basic ICT Skills (BICTS)					
se76	I am able to use word processor (MS Word) to create, edit and format documents for specific purposes.					
se77	I am able to use the internet to search for information and resources.					
se78	I am able to use email for communication.					
se79	I am able to use presentation software (Power Point) for delivery, eg. lesson or other presentation tasks.					

APPENDIX C
INTERVIEW GUIDE FOR BASIC SCHOOL ICT TEACHERS AND
STUDENTS

Pedagogical Support for ICT in Teaching and Learning of ICT

1. In your view as ICT teacher or student, can you confirm that ICT teaching and learning in the school require some form of pedagogical support for ICT provided and why it is needed?
2. Can you confirm pedagogical support for ICT required or needed for ICT teaching and learning in the school includes the provision of ICT infrastructure, ICT training, Incentive, School Facility and resource for teaching and learning and why do you think so?
3. Can you confirm that there is inadequate or lack of appropriate pedagogical support for ICT in the school for ICT teaching and learning and give reason(s) why support is lacking?
4. Do you think the teaching of ICT practicals requires more pedagogical support for ICT than the theory, especially with regard to ICT infrastructure and ICT Training and why do you think so?

Effectiveness of ICT Teaching and Learning

5. Can you confirm that ICT teaching and learning in the school is effective and state why you can confirm or not confirm?
6. Can you confirm the teaching and learning of ICT in the school is mainly the theory aspect and not the practical aspect and why is it so?
7. Can you say that it is the teaching and learning of ICT theory that is effective in the school but not the practical aspect?
8. Can you say the lack of ICT infrastructure and ICT training do not encourage the teaching and learning of ICT practicals in the school and why?
9. Would you say teachers' ability to prepare ICT lesson plan, teaching notes, deliver lesson in class and students ability to follow ICT lessons, preparedness to attend ICT class and readiness to participate in ICT assessment tasks can be used to measure/assess ICT teaching and learning effectiveness in the school and why?

ICT Self-efficacy

10. Can you confirm that you are able to use ICT to perform basic ICT tasks such as to create, edit and format document; use the internet to search for information and to send and access email?
11. Can you confirm you are not certain about your self-efficacy to prepare and use the Power Point in teaching or learning?

APPENDIX D

FOCUS GROUP DISCUSSION TOPICS/QUESTIONS

- i. Do your pedagogical support for ICT needs include ICT infrastructure, ICT training, Incentive, School Facility and resource for teaching and learning, and why?
- ii. Why do you think pedagogical support for ICT is lacking or appropriate pedagogical support for ICT not provided for ICT teaching and learning in the school?
- iii. Can you say lack of pedagogical support for ICT negatively affects ICT teaching in the school and explain why?
- iv. Can you say lack of pedagogical support for ICT negatively affects ICT learning in the school and explain why?
- v. Can you say lack of pedagogical support for ICT negatively affects your self-efficacy (ability) of ICT use in the school and explain why?
- vi. Why is it that teaching and learning of ICT is effective, despite there is general lack of pedagogical support for ICT in teaching and learning of ICT in the school?
- vii. If government cannot provide all the pedagogical support that ICT teaching and learning need at once, what will be your three most important pedagogical support for ICT areas government should first provide, tackle or concentrate on and why?

Thank you.

APPENDIX E

OBSERVATION STUDY CHECKLIST

School.....

District.....

Date.....

Time.....

Tick YES or NO for each of the following based on what your personal observation in the school is.

ISSUE	YES	NO
Pedagogical Support for ICT in Teaching and Learning of ICT	/////	/////
Computer laboratory available in the school		
There are adequate computers in the school (computer lab.)		
Computers installed with at least MS word, Excel, Power point		
Availability of classroom for ICT lessons		
Adequacy of classrooms for ICT lessons		
Tables and chairs in the classrooms for teachers and students to use during ICT lessons		
Notebooks available for ICT notes		
Exercise book available for ICT exercises		
Writing materials available		
Effectiveness of Teaching and Learning of ICT	/////	/////
Teacher is able to prepare ICT lesson plan		
Teacher is able to deliver/present ICT lessons		
Students are able to follow ICT lessons in class		
Students show willingness and attend ICT class		
Students participate in ICT assessment tasks		
ICT teaching and learning focus on practical		
ICT teaching and learning focus on theory		
ICT teaching and learning focus on both theory and practical		
ICT Self-Efficacy	/////	/////
Teacher/student is able to use word processor (MS Word) to create, edit and format document		
Teacher/student able to use the internet to search for information		
Teacher/student able to use email for communication (send and access email message)		

APPENDIX F
APPLICATION LETTER TO REQUEST INTRODUCTION LETTER FROM
DEPARTMENT

APPENDIX G
INTRODUCTION LETTER FROM DEPARTMENT OF EDUCATIONAL
LEADERSHIP

APPENDIX H
SAMPLE APPLICATION LETTER TO DISRICT/MUNICIPAL/METROLITAN
DIRECTORS OF EDUCATION FOR ACCESS TO SCHOOLS TO COLLECT
DATA

APPENDIX I
SAMPLE OF PERMISSION LETTER FROM
DISTRICT/MUNICIPAL/METROPOLITAN DIRECTORS OF EDUCATION
TO COLLECT DATA

APPENDIX J
SAMPLE LIST OF DISTRICT SCHOOLS BY CATEGORIZATION INTO
URBAN, SEMI-URBAN AND RURAL

APPENDIX K

INFORMED CONSENT FORM FOR TEACHER INTERVIEWEES

Study title: Assessing availability of pedagogical support for ICT in teaching and learning of ICT and teachers' and students' ICT self-efficacy in basic schools in Ghana

Purpose of study: The study aims to assess pedagogical support for ICT available for ICT teaching and learning and teachers' and students' ICT self-efficacy in the basic school. Before you agree to participate in this study, you must read and understand the information provided in the informed consent form. If you have questions, please ask the researcher before commencement of the interview session.

How many people will take part in the study? It is estimated that 620 ICT teacher and student participants in the basic school will be involved in the study. Already, 600 participants have responded to a questionnaire and the data analysed. It is expected that 5 ICT teachers and 5 students will be interviewed and 5 teachers and 5 students will be involved in a focus group discussion (FGD).

How much time will I spend for the interview? An estimated time of 20 -25 minutes will be needed for the interview.

What are the risks involved in part-taking in the interview? The researcher is not aware of any possible risks you will face by participating in the study. However, if you anticipate or experience any form of risk before, during or after the interview, you can draw the attention of the researcher for the necessary counselling to enable you cope. In case you need any counselling support after the interview, please call the researcher on 0243036223 for assistance.

What are the benefits of taking part in this study? There may be no immediate benefits to you personally for participating in this study. However, some participants in this study may benefit from an increase in self-awareness of the pedagogical support for ICT the teaching and learning of ICT receives as well as teachers' and students' perceived ICT self-efficacy in the basic school. But in future, the outcome may influence policy on ICT education in Ghana which you may benefit directly or indirectly.

What about confidentiality and protection? Study-related records will be held confidential. The information you provide will be kept strictly confidential. Participants' names will not be collected to protect and hide the identity of individuals. The results of this study may be published in subsequent journals, books and presentations.

Participation in the study is voluntary: You are free to decline to participate or to withdraw from this study at anytime, either during or after your participation, without negative consequences. The researcher is also free to terminate the study anytime.

I consent to participate in the study.

Yes [] No []

I agree with the use of my data for research in present and future studies.

Yes [] No []

Signature..... Date.....